An ecological and experimental study of sediment-benthos interactions in a polluted estuary

Volume 2

By

SAMIRA ABDUL-HUSSAIN ABDULA

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University of Glasgow

APPENDICES

APPENDIX I

APPENDIX I: TABLE 1. Abundance and biomass (wet and dry weights) of animals at Langbank mid-tide level. Data for small core technique, at 0-10 cm and 10-20 cm depth. Area of small core = 51.91 cm^2. Therefore the numbers of animals and biomass/core were multiplied by 192.6 to obtain numbers and biomass/m^2.

Species	Sample number	Depth (cm)	Abundance		Biomass of wet weight		Biomass of dry weight	
			No. of animals /core	No. of animals /m^2	Wet weight g/core	Wet weight g/m^2	Dry weight g/core	Dry weight g/m^2
Corophium volutator	1	0-10	35	6741.0	3.385	651.9	0.1383	26.63
		10-20	-	-	-	-	-	-
	2	0-10	37	7126.2	3.907	752.4	0.1462	28.15
		10-20	-	-	-	-	-	-
	3	0-10	34	6548.4	3.419	658.4	0.4947	95.28
		10-20	-	-	-	-	-	-
Nereis diversicolor	1	0-10	2	385.2	5.197	1000.9	0.6439	124.0
		10-20	7	1348.2	18.19	3503.4	2.254	434.1
	2	0-10	-	-	-	-	-	-
		10-20	6	1155.6	14.91	2872.2	1.866	359.3
	3	0-10	1	192.6	2.799	539.0	0.5491	105.7
		10-20	5	963.0	13.99	2695.0	2.745	528.7
Macoma baltica	1	0-10	2	385.2	0.6439	124.0	0.08500	16.37
		10-20	-	-	-	-	-	-
	2	0-10	1	192.6	0.1237	23.81	0.04250	8.186
		10-20	-	-	-	-	-	-
	3	0-10	2	385.2	0.2473	47.63	0.08500	16.37
		10-20	-	-	-	-	-	-

APPENDIX I: TABLE 2. Abundance and biomass (wet and dry weights) of animals at Langbank mid-tide level. Data for large core technique, at 0-10 cm and 10-20 cm depth. Area of large core = 89.91 cm^2. Therefore the numbers of animals and biomass/core were multiplied by 111.2 to obtain numbers and biomass/m^2.

Species	Sample number	Depth (cm)	Abundance		Biomass of wet weight		Biomass of dry weight	
			No. of animals /core	No. of animals /m^2	Wet weight g/core	Wet weight g/m^2	Dry weight g/core	Dry weight g/m^2
Corophium volutator	1	0-10	75	8340.0	7.253	806.5	0.2963	32.94
		10-20	-	-	-	-	-	-
	2	0-10	64	7116.8	6.256	695.7	0.2657	29.54
		10-20	-	-	-	-	-	-
	3	0-10	62	6894.4	6.061	673.9	0.2635	29.30
		10-20	-	-	-	-	-	-
Nereis diversicolor	1	0-10	1	111.2	2.799	311.2	0.5491	61.05
		10-20	4	444.8	11.19	1244.8	2.196	244.2
	2	0-10	2	222.4	5.198	578.0	0.6440	71.61
		10-20	6	667.2	16.71	1858.2	3.932	437.2
	3	0-10	1	111.2	2.868	318.9	0.6378	70.92
		10-20	6	667.2	16.90	1878.8	3.952	439.4
Macoma baltica	1	0-10	-	-	-	-	-	-
		10-20	-	-	-	-	-	-
	2	0-10	1	111.2	0.1328	14.76	0.07330	8.151
		10-20	1	111.2	0.1407	15.64	0.06995	7.778
	3	0-10	-	-	-	-	-	-
		10-20	-	-	-	-	-	-

APPENDIX I: TABLE 3. Abundance and biomass (wet and dry weights) of animals at Ardmore sediment mid-tide level. Data for small core technique, at 0-10 cm and 10-20 cm depth. Area of small core = 51.91 cm^2. Therefore the numbers of animals and biomass/core were multiplied by 192.6 to obtain the numbers and biomass/m^2.

Species	Sample number	Depth (cm)	Abundance		Biomass of wet weight		Biomass of dry weight	
			No. of animals /core	No. of animals /m^2	Wet weight g/core	Wet weight g/m^2	Dry weight g/core	Dry weight g/m^2
Pygospio elegans	1	0-10	23	4429.8	0.3600	69.33	0.2032	39.14
		10-20	-	-	-	-	-	-
	2	0-10	136	26193.6	2.016	388.2	1.202	231.4
		10-20	-	-	-	-	-	-
	3	0-10	36	6933.6	0.56340	108.5	0.3181	4.199
		10-20	-	-	-	-	-	-
Scoloplos armiger	1	0-10	2	385.2	0.08660	16.68	0.00890	1.714
		10-20	-	-	-	-	-	-
	2	0-10	3	577.8	0.2458	47.34	0.02795	5.383
		10-20	-	-	-	-	-	-
	3	0-10	2	385.2	0.08660	16.68	0.00890	1.714
		10-20	-	-	-	-	-	-
Corophium volutator	1	0-10	1	192.6	0.08670	16.70	0.00290	0.5505
		10-20	-	-	-	-	-	-
	2	0-10	-	-	-	-	-	-
		10-20	-	-	-	-	-	-
	3	0-10	1	192.6	0.07470	14.39	0.00870	1.676
		10-20	-	-	-	-	-	-

APPENDIX I: TABLE 4. Abundance and biomass (wet and dry weights) of animals at Ardmore sediment mid-tide level. Data from large core technique, at 0-10 cm and 10-20 cm depth. Area of large core = 89.9/cm^2. Therefore the numbers of animals and biomass/core were multiplied by 111.2 to obtain numbers and biomass/m^2.

Species	Sample number	Depth (cm)	Abundance		Biomass of wet weight		Biomass of dry weight	
			No. of animals /core	No. of animals /m^2	Wet weight g/core	Wet weight g/m^2	Dry weight g/core	Dry weight g/m^2
Pygospio elegans	1	0-10	45	5004.0	0.1917	21.32	0.02260	2.513
		10-20	-	-	-	-	-	-
	2	0-10	47	5226.4	0.1991	22.13	0.02580	2.869
		10-20	-	-	-	-	-	-
	3	0-10	55	6116.0	0.4380	48.70	0.03795	4.220
		10-20	-	-	-	-	-	-
Scoloplos armiger	1	0-10	1	111.2	0.06230	6.928	0.00940	1.045
		10-20	-	-	-	-	-	-
	2	0-10	2	222.4	0.02420	2.691	0.00460	0.5115
		10-20	-	-	-	-	-	-
	3	0-10	1	111.2	0.17580	19.54	0.01570	1.746
		10-20	-	-	-	-	-	-
Hydrobia ventrosa	1	0-10	1	111.2	0.02030	2.257	0.00470	0.5226
		10-20	-	-	-	-	-	-
	2	0-10	3	333.6	0.1572	17.48	0.01970	2.191
		10-20	-	-	-	-	-	-
	3	0-10	12	1334.4	0.07765	8.635	0.03390	3.770
		10-20	-	-	-	-	-	-
Macoma baltica	1	0-10	1	111.2	0.6598	73.37	0.3633	40.40
		10-20	-	-	-	-	-	-
	2	0-10	1	111.2	0.1237	13.75	0.1425	15.85
		10-20	-	-	-	-	-	-
	3	0-10	1	111.2	0.1390	15.46	0.1428	15.87
		10-20	-	-	-	-	-	-

APPENDIX I: TABLE 5. Means and standard deviations of wet and dry weight of *Arenicola marina* (dried for 48 hours at 60°C).

Replicates	Weight of *Arenicola* (g)	
	Wet weight	Dry weight
1	4.488	0.6228
2	3.375	0.5892
3	7.060	1.640
4	5.678	1.843
5	7.035	1.552
6	5.082	1.160
7	7.823	0.7562
8	5.965	1.544
9	4.617	0.7977
10	4.479	0.9408
11	4.841	1.229
12	4.734	0.7245
13	7.430	2.001
14	4.454	0.821
15	6.349	1.066
16	9.718	3.302
17	3.497	0.4548
18	4.403	0.6724
19	6.271	2.018
20	6.473	1.569
21	4.626	2.271
22	7.181	1.588
23	4.335	0.6362
24	5.659	0.9931
25	5.402	1.104
Mean ± s.d.	5.639 ± 1.494	1.276 ± 0.6643

APPENDIX I: TABLE 6. Abundance and biomass of Arenicola marina at Ardmore. See text for methods of calculation from cast counts.

Abundance		Biomass (wet weight)		Biomass (dry weight)	
No. casts/ m^2)	Means ± s.d. of (no. casts/m^2)	Wet weight/m^2 (g)	Means ± s.d. of wet weight	Dry weight/m^2 (g)	Means ± s.d. of dry weight
25	33.66 ± 7.572	141.0	189.8 ± 42.67	31.90	42.96 ± 9.660
37		208.6		47.21	
39		219.9		49.76	

APPENDIX I: TABLE 7. Student t-tests analysis of the abundance and biomasses of the different species at Langbank (LBM) and Ardmore (ARD) sampling sites. Comparisons were conducted between the number of animals obtained from the small and large cores for each species. Corophium volutator (C.v.), Nereis diversicolor (N.d.), Macoma baltica (M.b.), Pygospio elegans (P.e.), Scoloplos armiger (S.a.) and Hydrobia ventrosa (H.v.).

Sampling sites	Abundance and biomass	Comparison	D.F.	Student t	Probability	Small and large core
LBM	Abundance	C.v.	4	-1.343	0.3 > P > 0.2	
		N.d.	4	2.808	0.05 > P > 0.02 *	S > L
		M.b.	4	2.315	0.10 > P > 0.05	S > L
	Biomass	C.v.	2	0.8571	0.5 > P > 0.4	
		N.d.	4	0.7124	0.6 > P > 0.5	
		M.b.	4	1.396	0.3 > P > 0.2	
ARD	Abundance	P.e.	2	1.027	0.5 > P > 0.4	
		S.a.	4	4.062	0.02 > P > 0.01 **	S > L
		C.v.			P < 0.001 *****	S > L
		H.v.			P < 0.001 *****	L > S
		M.b.			P < 0.001 *****	L > S
	Biomass	P.e.	2	1.251	0.4 > P > 0.3	
		S.a.	4	1.441	0.3 > P > 0.2	
		C.v.			P < 0.001 *****	S > L
		H.v.	4	-2.305	0.2 > P > 0.1	
		M.b.	2	-2.939	0.1 > P > 0.05	L > S

APPENDIX I: TABLE 8. Mann Whitney U tests comparing the abundance of the different species present at Langbank (LBM) and Ardmore (ARD) sites. (C_1, C_6 = C. volutator, C_2 = N. diversicolor, C_3 = M. baltica, C_4 = P. elegans, C_5 = S. armiger, C_7 = H. ventrosa, C_8, C_{16} = M. baltica.)

Sediment	Comparison	W	Probability
LBM	$C_1 \times C_2$	57.00	$P = 0.0051_{***}$
	$C_1 \times C_3$	57.00	$P = 0.0051_{***}$
	$C_2 \times C_3$	57.00	$P = 0.0051_{***}$
ARD	$C_4 \times C_5$	57.00	$P = 0.0051_{***}$
	$C_4 \times C_6$	57.00	$P = 0.0051_{***}$
	$C_4 \times C_7$	57.00	$P = 0.0051_{***}$
	$C_4 \times C_8$	57.00	$P = 0.0051_{***}$
	$C_5 \times C_6$	53.00	$P = 0.0306_{*}$
	$C_5 \times C_7$	47.00	$P = 0.2298$
	$C_5 \times C_8$	54.00	$P = 0.0202_{*}$
	$C_6 \times C_7$	35.00	$P = 0.05_{*}$
	$C_6 \times C_8$	39.00	$P = 1.000$
	$C_7 \times C_8$	42.00	$P = 0.6889$

APPENDIX I: TABLE 9. Mann Whitney U tests comparing the dry biomass of the different species present at Langbank (LBM) and Ardmore (ARD) sites. (C_9, C_{14} = *C. volutator*, C_{10} = *N. diversicolor*, C_{11}, C_{16} = *M. baltica*, C_{12} = *P. elegans*, C_{13} = *S. armiger*, C_{15} = *H. ventrosa*.)

Sediment	Comparison	W	Probability
LBM	$C_9 \times C_{10}$	21.00	$P = 0.0051_{***}$
	$C_9 \times C_{11}$	57.00	$P = 0.0051_{***}$
	$C_{10} \times C_{11}$	57.00	$P = 0.0051_{***}$
ARD	$C_{12} \times C_{13}$	53.00	$P = 0.0306_{*}$
	$C_{12} \times C_{14}$	57.00	$P = 0.0051_{***}$
	$C_{12} \times C_{15}$	53.50	$P = 0.0250_{*}$
	$C_{12} \times C_{16}$	44.00	$P = 0.4712$
	$C_{13} \times C_{14}$	54.00	$P = 0.0202_{*}$
	$C_{13} \times C_{15}$	46.5	$P = 0.2623$
	$C_{13} \times C_{16}$	39.00	$P = 1.000$
	$C_{14} \times C_{15}$	35.00	$P = 0.5752$
	$C_{14} \times C_{16}$	33.00	$P = 0.3785$
	$C_{15} \times C_{16}$	34.50	$P = 0.5218$

APPENDIX I: TABLE 10. Preliminary experiment. Bacterial count of Langbank (LBM) and Ardmore (ARD) sediments on three media (freshwater nutrient agar, bacto-marine agar and teepol lactose agar). Numbers of bacteria were counted at five different dilutions, 10^{-1}, 10^{-2}, 10^{-3}, 10^{-4} and 10^{-5}, at 3, 5, 7, 10, 14 and 21 days after inoculation.

Sediment type	Media	R	10^{-1}						10^{-2}						10^{-3}						10^{-4}						10^{-5}					
			Days of counting after inoculation						Days after inoculation						Days after inoculation						Days after inoculation						Days after inoculation					
			(3)	(5)	(7)	(10)	(14)	(21)	(3)	(5)	(7)	(10)	(14)	(21)	(3)	(5)	(7)	(10)	(14)	(21)	(3)	(5)	(7)	(10)	(14)	(21)	(3)	(5)	(7)	(10)	(14)	(21)
LBM	Nutrient agar (freshwater)	R_1	550	674	835	855	879	895	3	94	111	145	302	319	1	12	18	19	45	49	-	3	3	3	7	8	-	-	-	-	-	1
		R_2	520	665	843	845	867	916	10	102	112	132	282	303	1	9	13	15	45	47	-	1	1	2	3	3	-	-	-	-	-	3
	Bacto-marine agar 2216E	R_1	144	300	558	565	620	637	26	75	203	205	230	236	3	11	25	27	36	48	2	2	2	3	3	5	-	-	-	-	-	-
		R_2	143	322	536	540	609	627	12	96	200	210	253	269	2	9	22	25	37	45	-	-	4	4	5	6	-	-	-	-	-	-
	Teepol lactose agar (coliform)	R_1	5	185	365	370	388	401	3	59	62	63	96	96	-	1	2	2	2	5	-	-	-	-	-	-	-	-	-	-	-	-
		R_2	1	165	325	350	370	370	-	9	15	20	29	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARD	Nutrient agar (freshwater)	R_1	17	29	101	112	200	250	-	1	12	13	47	48	-	-	-	-	5	5	-	-	-	-	-	-	-	-	1	1	1	1
		R_2	13	31	98	101	189	254	1	6	13	13	63	68	-	2	4	4	9	9	-	-	-	-	-	-	-	-	1	1	1	2
	Bacto-marine agar 2216E	R_1	17	23	36	38	60	66	1	2	2	3	10	11	-	-	-	-	2	2	-	-	-	-	1	1	-	-	-	-	-	1
		R_2	16	40	52	55	84	124	2	4	8	8	35	50	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	Teepol lactose agar (coliform)	R_1	-	-	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		R_2	-	-	1	1	1	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 10 continued overleaf

APPENDIX I: TABLE 11. Definitive experiment. Bacterial counts per plate from Langbank (LBM) and Ardmore (ARD) sediments on three media (freshwater nutrient agar, bacto-marine agar and teepol lactose agar). Numbers of bacteria were counted at five different dilutions, 10^{-1}, 10^{-2}, 10^{-3}, 10^{-4} and 10^{-5}, at 3, 5, 7, 10, 14 and 21 days after inoculation.

Sediment type	Media	R	10^{-1}						10^{-2}						10^{-3}						10^{-4}						10^{-5}					
			Days of counting						Days of counting						Days of counting						Days of counting						Days of counting					
			(3)	(5)	(7)	(10)	(14)	(21)	(3)	(5)	(7)	(10)	(14)	(21)	(3)	(5)	(7)	(10)	(14)	(21)	(3)	(5)	(7)	(10)	(14)	(21)	(3)	(5)	(7)	(10)	(14)	(21)
LBM	Nutrient agar (freshwater)	R_1	350	642	820	950	955	>1000	226	275	302	333	350	386	38	57	87	100	115	129	4	16	26	31	32	33	-	2	4	4	4	4
		R_2	360	695	803	943	950	>1000	232	283	312	363	363	392	40	87	117	137	137	145	3	14	24	31	31	34	-	-	-	-	-	-
	Bacto-marine agar 2216E	R_1	>1000	>1000	>1000	>1000	>1000	>1000	820	865	945	>1000	>1000	>1000	157	195	216	252	299	345	19	22	32	42	55	65	-	-	1	2	4	7
		R_2	>1000	>1000	>1000	>1000	>1000	>1000	835	876	952	>1000	>1000	>1000	127	145	185	267	306	348	37	41	46	57	62	70	6	7	9	12	12	13
	Teepol lactose agar	R_1	46	210	840	866	895	902	5	96	153	158	161	165	2	9	13	16	18	34	-	-	2	3	3	10	-	-	-	-	-	5
		R_2	49	223	810	841	886	899	6	99	152	154	159	161	1	8	21	22	22	37	-	-	2	2	2	12	-	-	-	-	-	2
ARD	Nutrient agar (freshwater)	R_1	14	86	136	197	206	212	1	15	23	32	34	36	-	-	-	2	3	6	-	-	-	1	1	1	-	-	-	-	-	-
		R_2	13	90	176	206	215	216	2	18	28	40	44	46	-	1	4	4	4	6	-	-	-	4	5	5	-	-	-	1	1	1
	Bacto-marine agar 2216E	R_1	451	502	557	583	592	600	49	55	74	89	129	134	6	9	12	29	38	42	1	1	2	3	3	3	-	1	1	1	1	2
		R_2	424	495	514	553	577	590	63	73	103	126	134	141	11	13	18	26	32	43	2	2	3	5	6	7	-	-	-	-	-	-
	Teepol lactose agar (coliform)	R_1	-	5	10	20	22	22	-	-	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		R_2	-	6	13	22	22	23	-	-	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX I: TABLE 12. Two-way analysis of variance testing the number of bacteria grown from Langbank (LBM) and Ardmore (ARD) sediments (Factor A) on three media, nutrient agar, bacto-marine agar 2216 and teepol lactose agar (Factor B).

Factors		Sum of squares	Means squares	D.F.	F-ratio	Probability
Factor A	LBM ARD	370602.0	370602.0	1	958.1	
Factor B	The three media	431895.4	215947.7	2	558.3	
Interaction		397458.4	198729.2	2	513.8	$P < 0.001$ *****
Error		2320.8	386.8	6		
Total		1202276.5		11		

APPENDIX I: TABLE 13. pH measurements of Langbank (LBM) and Ardmore (ARD) sediments at nine different depths and three different time intervals, 5, 10 and 20 seconds.

Sediment depth (cm)	Replicate	LBM			ARD		
		Time (secs)			Time (secs)		
		5	10	20	5	10	20
0	R_1	7.65	7.81	7.85	7.95	8.00	8.09
	R_2	7.65	7.70	7.75	7.98	8.01	8.19
5	R_1	7.70	8.00	7.95	8.01	8.03	8.15
	R_2	7.73	8.01	8.05	8.05	8.08	8.12
10	R_1	7.83	7.95	8.05	8.15	8.28	8.32
	R_2	7.80	8.00	8.04	8.17	8.27	8.35
15	R_1	7.90	7.98	8.10	8.15	8.35	8.50
	R_2	7.95	8.00	8.12	8.15	8.20	8.30
20	R_1	7.95	8.10	8.20	8.15	8.30	8.50
	R_2	8.00	8.09	8.20	8.20	8.25	8.40
25	R_1	8.10	8.10	8.15	8.20	8.35	8.55
	R_2	8.09	8.15	8.30	8.30	8.30	8.45
30	R_1	8.10	8.28	8.42	8.50	8.95	9.00
	R_2	8.10	8.25	8.40	7.95	8.70	8.80
35	R_1	8.15	8.30	8.45	8.90	9.00	9.10
	R_2	8.16	8.25	8.45	8.85	9.03	9.05
40	R_1	8.20	8.45	8.50	9.00	9.10	9.35
	R_2	8.15	8.45	8.45	9.01	9.20	9.25

APPENDIX I: TABLE 14. Eh measurements (mV) of Langbank (LBM) and Ardmore (ARD) sediments at nine different depths, and three different time intervals (5, 10 and 20 seconds).

Depth (cm)	Time (sec)	LBM	ARD
0	5	+410	+280
	10	+410	+290
	20	+410	+300
5	5	+180	+220
	10	+180	+230
	20	+180	+230
10	5	+300	+320
	10	+300	+320
	20	+290	+320
15	5	+290	+290
	10	+300	+290
	20	+310	+300
20	5	+380	+360
	10	+390	+360
	20	+390	+370
25	5	+350	+340
	10	+350	+350
	20	+340	+350
30	5	+310	+300
	10	+310	+300
	20	+300	+290
35	5	+330	+300
	10	+330	+300
	20	+340	+300
40	5	+280	+280
	10	+280	+290
	20	+290	+300

APPENDIX I: TABLE 15. Two-way analysis of variance of the organic carbon before cleaning, after ashing and after acid-cleaning of Langbank, Ardmore and Rockware sediments.

Factors	Sum of squares SS	Mean squares Ms	D.F.	F-ratio	Probability
A	200.8	100.4	2	4238.5	
B	141.6	70.78	2	2988.0	
Interaction	101.1	25.28	4	1067.3	$P < 0.001$ *****
Error	1.919	0.02369	81		
Total	445.4		89		

Factor A = Langbank and Ardmore sediments, Factor B = control, ashed and acid-cleaned

APPENDIX I: TABLE 16. Shear strength measurements of Langbank (LBM) and Ardmore (ARD) sediments to a depth of one metre at 5 cm intervals (P = peak; R = residual).

	LBM		ARD	
	P	R	P	R
0	0	0	0	0
5	0.028	0.028	0.028	0.028
10	0.042	0.042	0.042	0.042
15	0.056	0.042	0.056	0.056
20	0.084	0.070	0.056	0.056
25	0.112	0.112	0.084	0.070
30	0.182	0.112	0.126	0.112
35	0.182	0.154	0.196	0.168
40	0.224	0.168	0.308	0.294
45	0.238	0.168	0.350	0.294
50	0.224	0.168	0.280	0.280
55	0.224	0.196	0.280	0.252
60	0.252	0.210	0.308	0.266
65	0.224	0.196	0.238	0.224
70	0.252	0.168	0.224	0.210
75	0.294	0.196	0.196	0.168
80	0.266	0.196	0.182	0.154
85	0.294	0.224	0.168	0.154
90	0.308	0.224	0.154	0.126
95	0.280	0.210	0.140	0.112
100	0.308	0.280	0.140	0.112

Inman plot for a sediment having a normally distributed particle size

The Inman plot provides a graphical method of estimating the mean, standard deviation, kurtosis and skewness of naturally occurring marine sediments. However, neither Inman nor any other paper appears to give a clear analysis of a sediment having a normally distributed particle size. Therefore, I decided to investigate what would happen if I plotted a normally distributed particle size using Inman's method and his statistical measurements. In an Inman plot, the ϕ scale is plotted on the X-axis and a probability scale on the y-axis, and the particle size weights on different sieves are plotted cumulatively on the y-axis. A normally distributed curve when plotted using these axes gives a straight line (Snedecor and Cochran, 1980, p. 79 and Hazen, 1914).

Figure 1 shows four arbitrarily chosen straight lines each of which represents a different particle size distribution, where all the size distributions are normally distributed. The following statements about statistical parameters are true for all of these lines.

1. Median and mean

The median is the same as the mean, and it is represented by the 50% intercept on the y-axis. Therefore $a_3 = a_4 = 0$.

2. Skewness

Skewness and second skewness are both equal to zero. Because skewness equal $\alpha_\phi = a_3/\sigma_\phi$ and $a_3 = 0$, so $\sigma_\phi = 0$, and second skewness equal $\alpha_{2\phi} = a_4/\sigma_\phi$, $a_4 = 0$, and so $\sigma_\phi = 0$.

This is a graphical demonstration of the well known fact that a normal curve has no skewness.

3. Kurtosis

There are two measures of kurtosis. The first of these is an algebraic measure, K in Snedecor and Cochran (1980, p. 79), where $K = (x-\mu)^4/\sigma^4$ (see also Inman, 1952, p. 140). Inman (1952, p. 138) states that "There appears to be no simple graphic analogy for this moment". He therefore defines a new graphical estimate of kurtosis which he calls the phi kurtosis measure (B_ϕ). $B_\phi = \frac{1}{2}(a_1 + a_5)/\sigma_\phi$. For a normal curve Snedecor and Cochran K = 3.0 (Snedecor and Cochran 1980, p. 79; Inman, 1952, p. 140) and Inman's B_ϕ = 0.65 (Inman, 1952, p. 138). If the distribution is less peaked than a normal curve $K > 3.0$ and $B_\phi > 0.65$. If the curve is more peaked than a normal curve $K < 3.0$ and $B_\phi < 0.65$.

4. Standard deviation

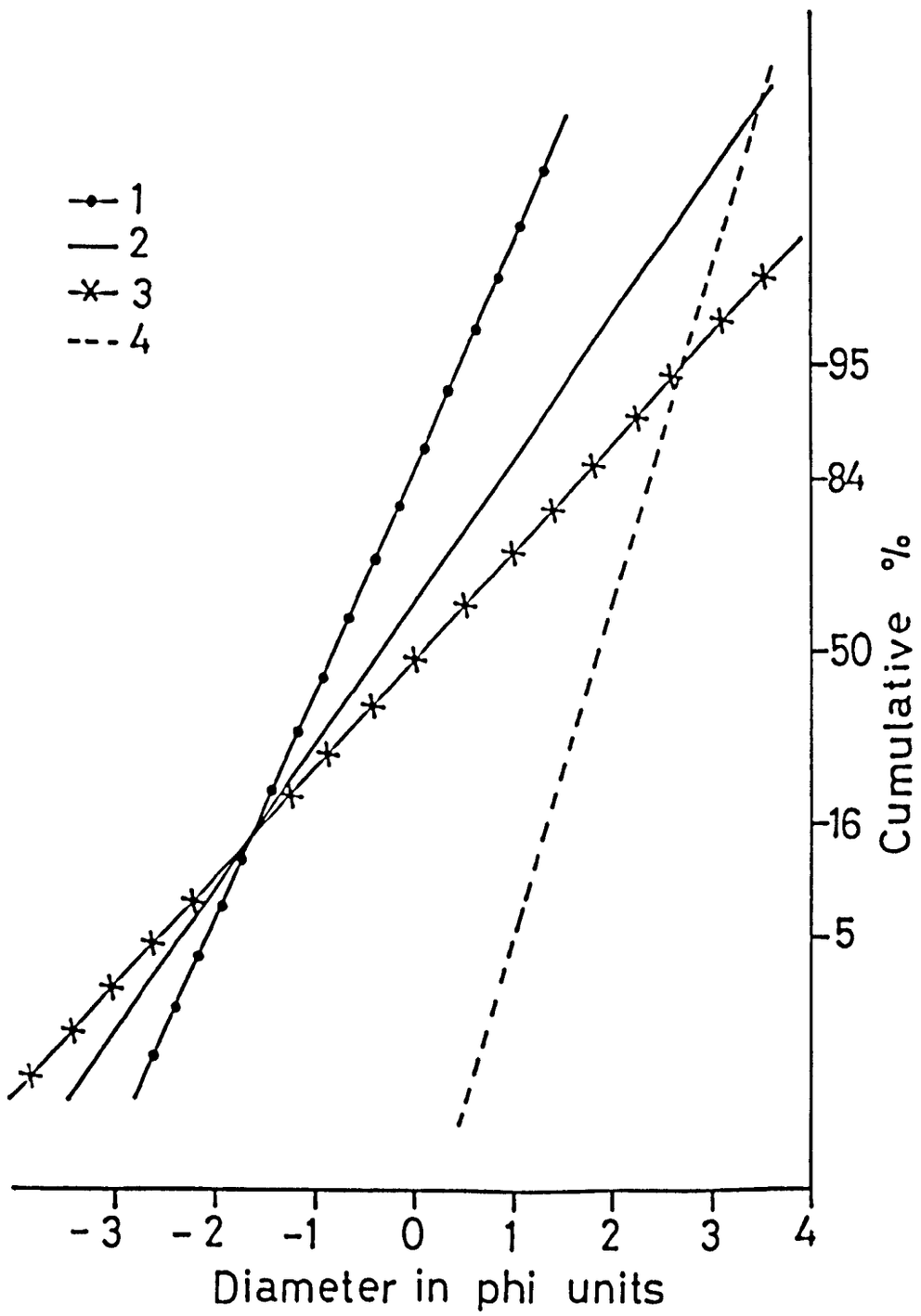
All curves on an Inman plot have a standard deviation defined as:

$$\sigma_\phi = \tfrac{1}{2} a_2$$

This is true whether the curves are normal or not. The values of these parameters for the arbitrarily chosen straight lines in Appendix I, Figure 1, are shown in Appendix I, Table 17.

Appendix I: Figure 1

Inman plot for four arbitrarily chosen straight lines each of which represents a different particle size distribution (normal).


1
2
3
4
95
84
50
16
5
Cumulative %
-3
-2
-1
0
1
2
3
4
Diameter in phi units

APPENDIX I: TABLE 17. Four arbitrarily chosen straight lines (normally distributed particle size).

Parameters obtained from Appendix I, Figure 1 using Inman's (1952) graphical method.

Nomenclature	Definition	Line's graph data			
		(1)	(2)	(3)	(4)
phi median diameter	$Md_\phi = \phi_{50}$	-0.85	-0.35	+0.05	+1.85
phi mean diameter	$M_\phi = Md_\phi + a_3$	-0.85	-0.35	+0.05	+1.85
Deviation measure) (standard deviation)	$\sigma_\phi = \frac{1}{2} a_2$	0.775	1.2	1.6	0.5125
Skewness	$\alpha_\phi = a_3 / \sigma_\phi$	0	0	0	0
Second skewness	$\alpha_2\phi = a_4 / \sigma_\phi$	0	0	0	0
Kurtosis	$\beta_\phi = \frac{1}{2} (a_1 + a_5) / \sigma_\phi$	0.65	0.65	0.66	0.68

APPENDIX I

Transformation of ϕ scale for particle size to μm

ϕ units and μm can be transformed from one to the other, since $\phi = -\log_2 (\mu m)$ where μm is the diameter of the particle.

(i) $0 \longrightarrow \mu m$

$$\phi = -\log_2 (mm)$$

$$-\phi = \log_2 (mm)$$

$$2^{-\phi} = {}_2\log_2 (mm)$$

$$2^{-\phi} = mm$$

$$\frac{1}{2^{\phi}} = mm$$

$$\frac{1}{2^{\phi}} \times 1000 = \mu m \text{ ----- (1)}$$

This transformation is easy because powers of 2 are involved and most hand calculators have an x^y function, in which case $x = 2$ and $y = \phi$.

(ii) $um \longrightarrow \phi$

From (1)

$$\frac{\mu m}{1000} = \frac{1}{2^{\phi}} = 2^{-\phi}$$

$$\log_2\left(\frac{\mu m}{1000}\right) = \log_2 \left(2^{-\phi}\right)$$

$$\log_2\left(\frac{\mu m}{1000}\right) = -\phi$$

$$-\log_2\left(\frac{\mu m}{1000}\right) = \phi \text{ ----- (2)}$$

However, there is no $\log_2$ function on most hand calculators. Hence one has to use the general relationship:

$$\log_n (x) = \frac{\log_m (x)}{\log_m (n)}$$

which becomes

$$\log_2 (X) = \frac{\log_{10} (X)}{\log_{10} (2)}$$

when n = 2 and m = 10

in equation (2) $= \frac{\mu m}{1000}$, and so

(2) becomes

$$-\log_2 \left(\frac{\mu m}{1000}\right) = -\left(\frac{\log_{10}\left(\frac{\mu m}{1000}\right)}{\log_{10} (2)}\right) = \text{Ø} \text{ ----- (3)}$$

APPENDIX II

APPENDIX II: TABLE 1. Two-way analysis of variance of the suspended weights of Langbank (LBM) and Rockware (RWS) sediments, removed with successive equal volumes of liquid at different time intervals (5, 10, 20, 40, 60 and 120 seconds), which was measured to determine the sampling times.

Factors		Sum of squares	Means squares	D.F	F-ratio	Probability
A-factor	LBM RWS	7.111	7.111	1	1252.0	
B-factor	times	13.28	2.657	5	467.7	
Interaction		5.252	1.050	5	184.9	$P < 0.001$ *****
Error		0.1363	0.005680	24		
Total		25.78		35		

APPENDIX II: TABLE 2. Experiment assessing best volumes for sediment sampling in the sedimentation experiments. Two-way analysis of variance of weights (mg/ml) of Langbank (LBM) and Rockware (RWS) sediments removed with different volumes (Factor B) at 5 seconds after inversion.

Factors		Sum of squares	Mean squares	D.F	F-ratio	Probability
A-factor	LBM RWS	0.0007224	0.0007224	1	7.636	
B-factor	different volumes	0.02851	0.007128	4	75.35	
Interaction		0.001217	0.0003044	4	3.218	$0.025 > P > 0.01$ **
Error		0.01797	0.00009460	190		
Total		4.842		199		

APPENDIX II: TABLE 3. Means and standard deviations of % water contents of wet and dry sediments, after being kept at the appropriate temperature 24 hours before use in the experiment at the required temperature.

Temperature	Sediment type	Means and standard deviation	Number of replicates
5°C	dry	0.2427 ± 0.05280	3
	wet	29.65 ± 0.9601	3
10°C	dry	0.5383 ± 0.1176	3
	wet	30.60 ± 0.4450	3
20°C	dry	0.5517 ± 0.06019	3
	wet	30.92 ± 0.6035	3

APPENDIX II: TABLE 4. Langbank sediment. Two-way anovar on suspended weights.

Factor A: Control/ashed/acid-cleaned;

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares	Mean squares	D.F	F-ratio	Probability
A-factor	treatments	0.001550	0.0007749	2	213.6	
B-factor	time	0.0007960	0.0001592	5	43.87	
Interactions		0.0002713	0.00002713	10	7.477	$P < 0.001$ *****
Error		0.0005878	0.000003628	162		
Total		0.003205		179		

APPENDIX II: TABLE 5. Ardmore sediment. Two-way anovar on suspended weights.

Factor A: Control/ashed/acid-cleaned;

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ms	D.F	F-ratio	Probability
A-factor	Control ashed acid-cleaned	0.001409	0.0007046	2	396.1	
B-factor		0.0008612	0.0001722	5	96.83	
Interaction		0.0003529	0.00003529	10	19.84	$P < 0.001$ *****
Error		0.0002882	0.000001779	162		
Total		0.002911		179		

APPENDIX II: TABLE 6. Rockware sediment. Two-way anovar on suspended weights.

Factor A: Control/ashed/acid-cleaned;

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares	Mean squares	D.F	F-ratio	Probability
A-factor	treatment	0.00002512	0.00001256	2	3.750	
B-factor	Time interval	0.0004711	0.00009422	5	28.13	
Interaction		0.00005759	0.000005759	10	1.919	$0.05 > P > 0.025$ *
Error		0.0005426		162		
Total		0.001096		179		

APPENDIX II: TABLE 7. Control sediment: two-way anovars on suspended weights.

Factor A: Langbank, Ardmore and Rockware sediments.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ms	D.F	F-ratio	Probability
A-factor	RWS LBM ARD	0.001455	0.0007274	2	121.0	
B-factor	Time	0.001899	0.0003798	5	63.15	
Interaction		0.0001378	0.00001378	10	2.291	$0.025 > P > 0.01$ **
Error		0.0009743	0.000006014	162		
Total		0.004466		179		

APPENDIX II: TABLE 8. Ashed sediments: two-way anovars on suspended weights.

Factor A: Langbank, Ardmore and Rockware sediments.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares	Mean squares	D.F	F-ratio	Probability
A-factor	LBM RWS ARD	7.664	3.832	2	2.686	
B-factor	Time	240.5	48.10	5	33.71	
Interaction		24.24	2.424	10	1.699	$0.10 > P > 0.05$
Error		231.2	1.427	162		
Total		503.6		179		

APPENDIX II: TABLE 9. Acid-cleaned sediments: two-way anovars on suspended weights.

Factor A: Langbank, Ardmore and Rockware sediments.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares	Mean squares	D.F	F-ratio	Probability
A-factor	LBM ARD RWS	199.4	99.72	2	59.14	
B-factor	Time	421.0	84.20	5	49.94	
Interaction		59.72	5.972	10	3.542	$P < 0.001$ *****
Error		273.1	1.686	162		
Total		953.3		179		

APPENDIX III TABLE 10. Original data of suspended weights (mg/ml) of wet and dry Langbank sediment during sedimentation at three different temperatures (5, 10 and 20°C), three different salinities (0, 50 and 100%) and at six time intervals (5, 10, 20, 40, 60 and 120 seconds). (R = replicates.)

Time (secs)	R	5°C						10°C						20°C					
		Wet			Dry			Wet			Dry			Wet			Dry		
		0%	50%	100%	0%	50%	100%	0%	50%	100%	0%	50%	100%	0%	50%	100%	0%	50%	100%
5	1	4.000	10.50	15.53	0.7750	2.075	8.825	5.600	10.50	20.08	0.8500	7.775	11.58	0.9750	2.575	9.325	0.09500	1.475	2.975
	2	4.050	11.03	20.03	0.5250	2.500	5.275	5.050	10.05	22.53	0.6750	8.000	10.00	0.9250	2.250	4.975	0.07500	1.425	2.825
	3	3.975	10.00	12.25	0.4750	2.125	9.025	5.575	6.775	25.08	0.7500	4.050	11.03	0.9500	2.250	9.400	0.09500	1.400	2.800
	4	4.025	15.03	15.60	0.4500	1.975	9.525	7.580	10.05	20.03	0.7750	6.700	15.00	0.9750	2.475	8.875	0.10000	1.450	2.800
	5	4.025	7.775	15.55	0.5250	1.975	9.000	5.050	17.78	17.55	0.2950	6.175	7.775	0.9500	2.350	4.975	0.07500	1.350	2.650
10	1	3.550	9.275	15.58	0.5250	1.525	7.025	7.775	10.08	15.00	0.9750	2.825	5.575	0.7500	1.650	7.275	0.06500	1.050	2.500
	2	3.425	8.775	14.50	0.7500	1.975	6.775	2.125	13.50	22.58	0.5000	7.775	6.000	0.7000	1.475	6.600	0.05000	1.025	2.250
	3	2.975	10.03	15.58	0.4750	1.575	7.000	2.100	11.60	15.03	0.4750	9.975	2.975	0.7750	1.525	4.975	0.05000	0.9750	2.100
	4	3.425	7.275	14.53	0.4750	1.850	6.975	3.050	6.000	10.03	0.9750	6.725	2.975	0.7750	1.575	6.625	0.05500	1.000	1.975
	5	3.035	8.200	14.78	0.4750	1.625	6.525	2.100	6.525	15.58	0.2250	2.750	6.775	0.7500	1.600	5.025	0.05500	1.000	2.000
20	1	2.075	2.975	13.03	0.2000	0.7750	5.500	2.100	8.050	11.18	0.0750	3.500	1.050	0.4500	1.275	2.250	0.05000	0.5500	1.050
	2	1.525	3.125	11.50	0.2250	0.5250	6.025	1.575	7.875	6.175	0.0500	2.750	1.000	0.4750	1.050	2.525	0.04500	0.5250	1.325
	3	1.875	4.025	15.03	0.2000	0.5000	6.275	2.100	7.025	10.00	0.1250	4.625	1.575	0.5000	1.175	2.025	0.04500	0.5750	1.425
	4	2.050	4.000	9.975	0.1750	0.7250	5.525	1.525	7.925	15.03	0.1750	2.750	1.075	0.4500	1.025	2.200	0.05000	0.5250	1.000
	5	2.050	4.050	12.53	0.2000	0.6250	5.975	1.275	5.275	10.53	0.1750	4.375	1.250	0.5000	1.275	2.000	0.04500	0.5500	1.250
40	1	1.550	2.000	5.575	0.2000	0.2750	4.275	0.7250	7.275	10.00	0.07500	2.225	1.050	0.3500	0.7250	1.250	0.03500	0.3500	0.5500
	2	1.475	1.875	5.000	0.2000	0.3250	3.025	0.6750	2.925	11.50	0.05000	1.775	1.000	0.3250	0.6000	0.9750	0.04500	0.3750	0.6750
	3	1.525	1.800	4.550	0.1750	0.2500	2.600	0.3750	7.025	10.53	0.02500	2.875	1.500	0.2500	0.5250	0.9250	0.04500	0.3000	0.4750
	4	1.525	1.475	1.175	0.1750	0.3000	2.775	0.4750	2.975	10.00	0.04500	3.125	0.6750	0.2750	0.6000	1.000	0.04000	0.3250	0.4500
	5	1.475	1.750	3.275	0.1500	0.3000	2.500	1.075	8.000	10.58	0.10000	2.375	1.250	0.3000	0.5500	0.9750	0.0400	0.3500	0.4250
60	1	1.250	0.6000	0.8750	0.1250	0.2750	1.075	0.6750	2.075	6.675	0.05000	0.2750	0.5000	0.0750	0.3500	0.5250	0.01000	0.2250	0.3750
	2	0.9750	0.5750	0.6750	0.1500	0.2500	1.025	0.3750	1.600	7.525	0.02500	0.2750	0.2500	0.1000	0.3750	0.4250	0.01500	0.2250	0.3500
	3	1.025	0.5500	0.5250	0.1750	0.2250	0.9750	0.4750	2.050	2.775	0.02500	0.1750	0.2750	0.1250	0.3250	0.4500	0.01500	0.2000	0.3500
	4	1.000	0.5250	1.175	0.1500	0.2000	0.9750	0.4500	1.800	10.53	0.05000	0.2250	0.7500	0.07500	0.4000	0.5000	0.00500	0.2500	0.3000
	5	1.075	0.5750	0.9750	0.1000	0.2500	0.8250	0.4000	2.025	7.750	0.00200	0.2500	0.5000	0.1000	0.3500	0.5250	0.01000	0.2250	0.3750
120	1	1.000	0.05000	0.2500	0.01000	0.2250	0.5250	0.2750	1.125	6.175	0.00500	0.0500	0.1000	0.05000	0.05000	0.0550	0.00500	0.01000	0.02500
	2	1.025	0.04500	0.5750	0.01000	0.2750	0.4250	0.3000	1.600	8.750	0.01000	0.0250	0.1500	0.04500	0.04500	0.1000	0.00200	0.01500	0.02500
	3	0.8750	0.07500	0.2500	0.00500	0.1500	0.4500	0.2500	0.6000	7.775	0.00200	0.0750	0.0750	0.02500	0.04500	0.0500	0.00200	0.01000	0.05000
	4	0.9000	0.07500	0.3250	0.00200	0.2250	0.4000	0.2250	1.100	2.750	0.00200	0.0500	0.0750	0.02500	0.05500	0.0500	0.01000	0.01000	0.05000
	5	0.9000	0.05000	0.3000	0.00200	0.2000	0.4500	0.2000	1.575	2.750	0.01000	0.0500	0.1000	0.02500	0.05000	0.0750	0.01000	0.01500	0.02500

APPENDIX II: TABLE 11. Langbank sediment. Two-way anovar on suspended weight (mg/ml) at 5°C and 0% salinity.

Factor A: Wet/dry sediments.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	D.F	Mean squares Ss/D.F	F-ratio	Probability
A-factor	Wet sediment Dry sediment	0.0002058	1	0.0002058	358511	
B-factor	Time	0.0001084	5	0.00002178	377.65	
Interaction		0.00005385	5	0.00001077	187.63	P < 0.001 *****
Error		0.000002755	48	0.00000005740		
Total		0.0003708	59			

APPENDIX II: TABLE 12. Langbank sediment. Two-way anovar on suspended weights (mg/ml) at 5°C and 50% salinity.

Factor A: Wet/dry sediment.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	D.F	Mean squares Ss/D.F	F-ratio	Probability
A-factor	Wet sediment Dry sediment	0.0006983	1	0.0006983	246.36	
B-factor	Time	0.001426	5	0.0002853	100.64	
Interaction		0.0006751	5	0.0001350	47.64	P < 0.001 *****
Error		0.0001361	48	0.000002834		
Total		0.002936	59			

APPENDIX II: TABLE 13. Langbank sediment. Two-way anovar, on suspended weights (mg/ml) at 5°C and 100% salinity.

Factor A: Wet/dry sediments.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	D.F	Mean squares Ss/D.F	F-ratio	Probability
A-factor	Wet sediment Dry sediment	0.0008653	1	0.0008653	142.08	
B-factor	Time	0.005374	5	0.001075	176.47	
Interaction		0.0007894	5	0.0001579	25.92	P < 0.001 *****
Error		0.0002923	48	0.000006090		
Total		0.007321	59			

APPENDIX II: TABLE 14. Langbank sediment. Two-way anovar on suspended weight (mg/ml) at 10°C and 0% salinity.

Factor A: Wet/dry sediments.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	D.F	Mean squares Ss/D.F	F-ratio	Probability
A-factor	Wet sediment Dry sediment	0.0003606	1	0.0003606	10.25	
B-factor	Time	0.0007744	5	0.0001549	4.403	
Interaction		0.0005820	5	0.0001164	3.309	0.025> P> 0.01 **
Error		0.001689	48	0.00003518		
Total		0.003405	59			

APPENDIX II: TABLE 15. Langbank sediment. Two-way anovar on suspended weights (mg/ml) at 10°C and 50% salinity.

Factor A: Wet/dry sediments.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	D.F	Mean squares Ss/D.F	F-ratio	Probability
A-factor	Wet sediment Dry sediment	0.0004612	1	0.0004612	25.75	
B-factor	Time	0.002076	5	0.0004152	23.18	
Interaction		0.0001327	5	0.00002653	1.481	0.25>P>0.10
Error		0.0008598	48	0.00001791		
Total		0.003530	59			

APPENDIX II: TABLE 16. Langbank sediment. Two-way anovar on suspended weights (mg/ml) at 10°C and 100% salinity.

Factor A: Wet/dry sediments.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	D.F	Mean squares Ss/D.F	F-ratio	Probability
A-factor	Wet sediment Dry sediment	0.003970	1	0.003970	178.52	
B-factor	Time	0.005261	5	0.001052	47.32	
Interaction		0.0003068	5	0.00006136	2.759	$0.05 > P > 0.025$ *
Error		0.001067	48	0.00002224		
Total		0.01061	59			

APPENDIX II: TABLE 17. Langbank sediment. Two-way anovar on suspended weights (mg/ml) at 20°C and 0% salinity.

Factor A: Wet/dry sediments.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factor		Sum of squares Ss	D.F	Mean squares Ss/D.F	F-ratio	Probability
A-factor	Wet sediment Dry sediment	0.000009298	1	0.000009298	6332.63	
B-factor	Time	0.000007779	5	0.000001556	1059.62	
Interaction		0.000005630	5	0.000001126	766.90	P < 0.001 *****
Error		0.00000007048	48	0.00000001468		
Total		0.00002278	59			

APPENDIX II: TABLE 18. Langbank sediment. Two-way anovar on suspended weights (mg/ml) at 20°C and 50% salinity.

Factor A: Wet/dry sediments.

Factor : Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factor		Sum of squares Ss	D.F	Mean squares Ss/D.F	F-ratio	Probability
A-factor	Wet sediment Dry sediment	0.00001094	1	0.00001094	647.16	
B-factor	Time	0.00009635	5	0.00001927	1139.9	
Interaction		0.000006011	5	0.000001202	71.12	$P < 0.001$ *****
Error		0.0000008114	48	0.00000001690		
Total		0.0001141	59			

APPENDIX II: TABLE 19. Langbank sediment. Two-way anovar on suspended weights (mg/ml) at 20°C and 100% salinity.

Factor A: Wet/dry sediments.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	D.F	Mean squares Ss/D.F	F-ratio	Probability
A-factor	Wet sediment Dry sediment	0.0001769	1	0.0001769	79.84	
B-factor	Time	0.0008971	5	0.0001794	81.00	
Interaction		0.0002115	5	0.00004230	19.10	$P < 0.001$ *****
Error		0.0001063	48	0.000002215		
Total		0.001392	59			

APPENDIX II: TABLE 20. Comparison of wet and dry Langbank sediment by one-way anovars of suspended weights (mg/ml) at the six different time intervals: 0% salinity, 5°C data.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	30.02	30.02	1	3394.0	P < 0.001
	Error	0.07075	0.008844	8		
	Total	30.09		9		*****
10	Main	18.80	18.80	1	462.7	P < 0.001
	Error	0.3250	0.04062	8		
	Total	19.12		9		*****
20	Main	7.353	7.353	1	271.1	P < 0.001
	Error	0.2170	0.02713	8		
	Total	7.570		9		*****
40	Main	4.422	4.422	1	5660.5	P < 0.001
	Error	0.006250	0.0007813	8		
	Total	4.429		9		*****
60	Main	2.139	2.139	1	332.3	P < 0.001
	Error	0.05150	0.006438	8		
	Total	2.191		9		*****
120	Main	2.182	2.182	1	953.0	P < 0.001
	Error	0.01831	0.002289	8		
	Total	2.200		9		*****

APPENDIX II: TABLE 21. Comparison of wet and dry Langbank sediment by one-way anovars of suspended weight at the six different time intervals: 50% salinity, 5°C data.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	190.8	190.8	1	54.60	P < 0.001
	Error	27.95	3.494	8		
	Total	218.7		9		*****
10	Main	122.5	122.5	1	216.7	P < 0.001
	Error	4.522	0.5652	8		
	Total	127.0		9		*****
20	Main	22.58	22.58	1	149.1	P < 0.001
	Error	1.211	0.1512	8		
	Total	23.79		9		*****
40	Main	5.550	5.550	1	286.5	P < 0.001
	Error	0.1550	0.01938	8		
	Total	5.705		9		*****
60	Main	0.2641	0.2641	1	325.0	P < 0.001
	Error	0.006500	0.0008125	8		
	Total	0.2706		9		*****
120	Main	0.06084	0.06084	1	53.37	P < 0.001
	Error	0.009120	0.001140	8		
	Total	0.06996		9		*****

APPENDIX II: TABLE 22. Comparison of wet/dry Langbank sediment by one-way anovars of suspended weight at the six different time intervals: 100% salinity, 5°C data.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	139.2	139.2	1	26.14	$P < 0.001$
	Error	42.61	5.326	8		
	Total	181.8		9		*****
10	Main	165.4	165.4	1	964.9	$P < 0.001$
	Error	1.371	0.1714	8		
	Total	166.8		9		*****
20	Main	107.4	107.4	1	59.33	$P < 0.001$
	Error	14.47	1.809	8		
	Total	121.8		9		*****
40	Main	1.936	1.936	1	1.081	$0.50 > P > 0.25$
	Error	14.33	1.792	8		
	Total	16.27		9		
60	Main	0.04225	0.04225	1	1.154	$0.50 > P > 0.025$
	Error	0.2930	0.03663	8		
	Total	0.3353		9		
120	Main	0.03025	0.03025	1	2.951	$0.25 > P > 0.10$
	Error	0.0820	0.01025	8		
	Total	0.1123		9		

APPENDIX II: TABLE 23. Comparison of wet/dry Langbank sediment by one-way anovars of suspended weight at the six different time intervals: 0% salinity, 10°C data.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	65.08	65.08	1	113.9	$P < 0.001$
	Error	4.570	0.5713	8		
	Total	69.65		9		*****
10	Main	19.60	19.60	1	6.346	$0.05 > P > 0.025$
	Error	24.71	3.088	8		
	Total	44.31		9		*
20	Main	6.360	6.360	1	91.06	$P < 0.001$
	Error	0.5588	0.06984	8		
	Total	6.919		9		*****
40	Main	0.9181	0.9181	1	24.87	$0.005 > P > 0.001$
	Error	0.2954	0.03692	8		
	Total	1.213		9		****
60	Main	0.4942	0.4942	1	68.30	$P < 0.001$
	Error	0.05788	0.007235	8		
	Total	0.5521		9		*****
120	Main	0.1491	0.1491	1	188.9	$P < 0.001$
	Error	0.006315	0.0007894	8		
	Total	0.1554		9		*****

APPENDIX II: TABLE 24. Comparison of wet/dry Langbank sediment by one-way anovars of suspended weight at the six different time intervals: 50% salinity, 10°C data.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	50.42	50.42	1	5.316	$0.10 > P > 0.05$
	Error	75.88	9.486	8		
	Total	126.3		9		
10	Main	31.15	31.15	1	3.041	$0.25 > P > 0.10$
	Error	81.95	10.24	8		
	Total	113.1		9		
20	Main	32.94	32.94	1	30.85	$P < 0.001$
	Error	8.542	1.068	8		
	Total	41.48		9		*****
40	Main	25.04	25.04	1	7.771	$0.025 > P > 0.01$
	Error	25.78	3.222	8		
	Total	50.82		9		**
60	Main	6.972	6.972	1	318.3	$P < 0.001$
	Error	0.1753	0.02191	8		
	Total	7.148		9		*****
120	Main	3.306	3.306	1	39.04	$P < 0.001$
	Error	0.6775	0.08469	8		
	Total	3.984		9		*****

APPENDIX II: TABLE 25. Comparison of wet/dry Langbank sediment by one-way anovars of suspended weight at the six different time intervals: 100% salinity, 10°C data.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	248.9	248.9	1	32.98	$P < 0.001$
	Error	60.37	7.546	8		
	Total	309.2		9		*****
10	Main	290.6	290.6	1	24.98	$0.005 > P > 0.001$
	Error	93.06	11.63	8		
	Total	383.7		9		****
20	Main	220.6	220.6	1	43.98	$P < 0.001$
	Error	40.13	5.016	8		
	Total	260.7		9		*****
40	Main	222.2	222.2	1	945.2	$P < 0.001$
	Error	1.880	0.2350	8		
	Total	224.1		9		*****
60	Main	108.8	108.8	1	27.70	$P < 0.001$
	Error	31.41	3.926	8		
	Total	140.2		9		*****
120	Main	76.73	76.73	1	19.66	$0.005 > P > 0.001$
	Error	31.22	3.903	8		
	Total	108.0		9		****

APPENDIX II: TABLE 26. Comparison of wet/dry Langbank sediment by one-way anovars of suspended weight at the six different time intervals: 0% salinity, 20°C data.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	1.879	1.879	1	6452.3	$P < 0.001$
	Error	0.00233	0.0002913	8		
	Total	1.882		9		*****
10	Main	1.208	1.208	1	2477.1	$P < 0.001$
	Error	0.0039	0.0004875	8		
	Total	1.211		9		*****
20	Main	0.4580	0.4580	1	1448.1	$P < 0.001$
	Error	0.00253	0.0003163	8		
	Total	0.4605		9		*****
40	Main	0.1677	0.1677	1	212.3	$P < 0.001$
	Error	0.00632	0.00079	8		
	Total	0.1740		9		*****
60	Main	0.01764	0.01764	1	77.54	$P < 0.001$
	Error	0.00182	0.0002275	8		
	Total	0.01946		9		*****
120	Main	0.001988	0.001988	1	23.23	$P < 0.001$
	Error	0.0006848	0.0000856	8		
	Total	0.002673		9		*****

APPENDIX II: TABLE 27. Comparison of wet/dry Langbank sediment by one-way anovars of suspended weight at the six different time intervals: 50% salinity, 20°C data.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	2.304	2.304	1	202.5	P < 0.001
	Error	0.091	0.01138	8		
	Total	2.395		9		*****
10	Main	0.7701	0.7701	1	286.5	P < 0.001
	Error	0.0215	0.002688	8		
	Total	0.7916		9		*****
20	Main	0.9456	0.9456	1	128.8	P < 0.001
	Error	0.05875	0.007344	8		
	Total	1.004		9		*****
40	Main	0.196	0.1690	1	50.07	P < 0.001
	Error	0.169	0.003375	8		
	Total	0.027		9		*****
60	Main	0.04556	0.04556	1	81.00	P < 0.001
	Error	0.0045	0.0005625	8		
	Total	0.05006		9		*****
120	Main	0.003423	0.003423	1	273.8	P < 0.001
	Error	0.0001	0.0000125	8		
	Total	0.003523		9		*****

APPENDIX II: TABLE 28. Comparison of wet/dry Langbank sediment by one-way anovars of suspended weight at the six different time intervals: 100% salinity, 20°C data.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	55.23	55.23	1	20.42	$0.005 > P > 0.001$
	Error	21.64	2.704	8		
	Total	76.86		9		****
10	Main	38.71	38.71	1	68.60	$P < 0.001$
	Error	4.515	0.5643	8		
	Total	43.23		9		******
20	Main	2.450	2.450	1	63.33	$P < 0.001$
	Error	0.3095	0.03869	8		
	Total	2.760		9		******
40	Main	0.6503	0.6503	1	48.62	$P < 0.001$
	Error	0.1070	0.01338	8		
	Total	0.7573		9		******
60	Main	0.04556	0.04556	1	30.38	$P < 0.001$
	Error	0.0120	0.0015	8		
	Total	0.05756		9		******
120	Main	0.002403	0.002403	1	7.336	$0.05 > P > 0.025$
	Error	0.00262	0.0003275	8		
	Total	0.005023		9		*

APPENDIX II: TABLE 29. Langbank sediment. Two-way anovar on suspended weight of wet sediment at 20°C.

Factor A: Different salinities.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	0% S 50% S 100% S	0.0003974	0.0001989	2	135.7	
B-factor	Time	0.0006275	0.0001255	5	85.69	
Interaction		0.0004474	0.00004474	10	30.55	P < 0.001 *****
Error		0.0001055	0.000001465	72		
Total		0.001578		89		

APPENDIX II: TABLE 30. Langbank sediment. Two-way anovar on suspended weights of wet sediment at 10°C.

Factor A: Different salinities.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	0% S 50% S 100% S	0.004729	0.002364	2	52.24	
B-factor	Time	0.005645	0.001129	5	24.95	
Interaction		0.0007473	0.00007473	10	1.651	0.25>P>0.10
Error		0.003259	0.00004526	72		
Total		0.01438		89		

APPENDIX II: TABLE 31. Langbank sediment. Two-way anovar on suspended weight of wet sediment at 5°C.

Factor A: Different salinities.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	0% S 50% S 100% S	0.002162	0.001081	2	210.6	
B-factor	Time	0.005334	0.001067	5	207.9	
Interaction		0.001958	0.0001958	10	38.14	$P < 0.001$ *****
Error		0.0003695	0.000005133	72		
Total		0.009823		89		

APPENDIX II: TABLE 32. Langbank sediment. Two-way anovar on suspended weight of dry sediment at 20°C.

Factor A: Different salinities.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	0% S 50% S 100% S	0.00007796	0.00003898	2	1609.14	
B-factor	Time	0.00009154	0.00001831	5	755.8	
Interaction		0.00005790	0.000005790	10	239.03	$P < 0.001$ *****
Error		0.000001744	0.00000002422	72		
Total		0.0002291		89		

APPENDIX II: TABLE 33. Langbank sediment. Two-way anovar on suspended weight of dry sediment at 10°C.

Factor A: Different salinities.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	0% S 50% S 100% S	0.0006676	0.0003338	2	62.52	
B-factor	Time	0.001655	0.0003310	5	61.99	
Interaction		0.0009300	0.00009300	10	17.42	P< 0.001 *****
Error		0.0003844	0.000005339	72		
Total		0.003637		89		

APPENDIX II: TABLE 34. Langbank sediment. Two-way anovar on suspended weight of dry sediment at $5^{o}C$.

Factor A: Different salinities.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	0% S 50% S 100% S	0.001108	0.0005540	2	655.5	
B-factor	Time	0.0005942	0.0001188	5	140.6	
Interaction		0.0005354	0.00005354	10	63.35	$P < 0.001$ *****
Error		0.00006085	0.0000008451	72		
Total		0.002298		89		

APPENDIX II: TABLE 35. Comparison of suspended weight (mg/ml) in the three different salinities by one-way anovars, wet Langbank sediment, 5°C. Main factor = 0%, 50% and 100% salinity.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	349.7	174.9	2	35.93	$P < 0.001$
	Error	58.39	4.866	12		
	Total	408.1		14		******
10	Main	343.3	171.6	2	353.5	$P < 0.001$
	Error	5.827	0.4856	12		
	Total	349.1		14		******
20	Main	316.8	158.4	2	123.8	$P < 0.001$
	Error	15.36	1.280	12		
	Total	332.2		14		******
40	Main	17.36	8.679	2	8.393	$0.01 > P > 0.005$
	Error	12.41	1.034	12		
	Total	29.77		14		***
60	Main	0.6280	0.3140	2	12.17	$0.005 > P > 0.001$
	Error	0.3095	0.02579	12		
	Total	0.9375		14		****
120	Main	2.025	1.0126	2	131.5	$P < 0.001$
	Error	0.09237	0.007698	12		
	Total	2.118		14		*****

APPENDIX II: TABLE 36. Comparison of suspended weight (mg/ml) in the three different salinities by one-way anovars, wet Langbank sediment, 10°C. Main factor = 0%, 50% and 100% salinity.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	602.5	301.3	2	35.16	P < 0.001
	Error	102.8	8.567	12		
	Total	705.3		14		******
10	Main	372.7	186.4	2	15.26	P < 0.001
	Error	146.5	12.21	12		
	Total	519.2		14		******
20	Main	200.5	100.3	2	26.25	P < 0.001
	Error	45.84	3.820	12		
	Total	246.4		14		******
40	Main	242.8	121.4	2	55.12	P < 0.001
	Error	26.43	2.203	12		
	Total	269.2		14		******
60	Main	119.5	59.76	2	22.81	P < 0.001
	Error	31.43	2.619	12		
	Total	150.9		14		******
120	Main	82.78	41.39	2	15.57	P < 0.001
	Error	31.96	2.659	12		
	Total	114.7		14		******

APPENDIX II: TABLE 37. Comparison of suspended weight (mg/ml) in the three different salinities by one-way anovars, wet Langbank sediment, 20°C. Main factor = 0%, 50% and 100% salinity.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	118.9	59.43	2	32.92	$P < 0.001$
	Error	21.67	1.805	12		
	Total	140.5		14		******
10	Main	83.09	41.54	2	114.6	$P < 0.001$
	Error	4.350	0.3625	12		
	Total	87.44		14		******
20	Main	7.544	3.772	2	190.0	$P < 0.001$
	Error	0.2383	0.0199	12		
	Total	7.782		14		******
40	Main	1.327	0.6635	2	82.73	$P < 0.001$
	Error	0.09625	0.008021	12		
	Total	1.423		14		******
60	Main	0.3966	0.1983	2	179.6	$P < 0.001$
	Error	0.01325	0.001104	12		
	Total	0.4098		14		******
120	Main	0.002563	0.001282	2	6.008	$0.025 > P > 0.01$
	Error	0.00256	0.0002133	12		
	Total	0.005123		14		**

APPENDIX II: TABLE 38. Comparison of suspended weight (mg/ml) in the three different salinities by one-way anovars, dry Langbank sediment, 5°C. Main factor = 0%, 50% and 100% salinity.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	99.83	49.92	2	54.51	P < 0.001
	Error	9.157	0.9157	12		
	Total	109.0		14		*****
10	Main	113.1	56.53	2	175.4	P < 0.001
	Error	0.3860	0.03217	12		
	Total	113.4		14		*****
20	Main	99.29	49.64	2	115.6	P < 0.001
	Error	0.5138	0.0428	12		
	Total	99.80		14		*****
40	Main	26.16	13.082	2	75.26	P < 0.001
	Error	2.086	0.1738	12		
	Total	28.25		14		*****
60	Main	2.079	1.040	2	300.6	P < 0.001
	Error	0.04150	0.003458	12		
	Total	2.121		14		*****
120	Main	0.4938	0.2470	2	173.6	P < 0.001
	Error	0.01706	0.001422	12		
	Total	0.5109		14		*****

APPENDIX II: TABLE 39. Comparison of suspended weight (mg/ml) in the three different salinities by one-way anovars, dry Langbank sediment, 10°C. Main factor = 0%, 50% and 100% salinity.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	272.3	136.1	2	43.09	P < 0.001
	Error	37.91	3.160	12		
	Total	310.2		14		*****
10	Main	80.27	40.13	2	9.062	P < 0.001
	Error	53.15	4.429	12		
	Total	133.4		14		*****
20	Main	31.77	15.89	2	57.08	P < 0.001
	Error	3.340	0.2783	12		
	Total	35.11		14		*****
40	Main	14.69	7.346	2	57.84	P < 0.001
	Error	1.524	0.1270	12		
	Total	16.22		14		*****
60	Main	0.4507	0.2254	2	15.53	P < 0.001
	Error	0.1741	0.01451	12		
	Total	0.6249		14		*****
120	Main	0.02221	0.01111	2	26.31	P < 0.001
	Error	0.005065	0.0004221	12		
	Total	0.02728		14		*****

APPENDIX II: TABLE 40. Comparison of suspended weight (mg/ml) in the three different salinities by one-way anovars, dry Langbank sediment, 20°C. Main factor = 0%, 50% and 100% salinity.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	18.53	9.263	2	1762.1	P < 0.001
	Error	0.06308	0.005257	12		
	Total	18.59		14		*****
10	Main	11.16	5.582	2	351.8	P < 0.001
	Error	0.1904	0.01587	12		
	Total	11.35		14		*****
20	Main	3.405	1.702	2	154.1	P < 0.001
	Error	0.1325	0.01104	12		
	Total	3.537		14		*****
40	Main	0.5745	0.2873	2	78.22	P < 0.001
	Error	0.04407	0.003673	12		
	Total	0.6186		14		*****
60	Main	0.2939	0.1470	2	347.8	P < 0.001
	Error	0.005070	0.0004225	12		
	Total	0.2990		14		*****
120	Main	0.002462	0.001231	2	16.80	P < 0.001
	Error	0.0008796	0.00007330	12		
	Total	0.003342		14		*****

APPENDIX II: TABLE 41. Langbank sediment. Two-way anovar on suspended weight of wet sediment at 0% salinity.

Factor A: Different temperatures.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	$5^{o}C$ $10^{o}C$ $20^{o}C$	0.0003383	0.0001691	2	7.204	
B-factor	Time	0.0008913	0.0001783	5	7.593	
Interactions		0.0006156	0.00006156	10	2.622	$0.05 > P > 0.025$ *
Error		0.001690	0.00002348	72		
Total		0.003536		89		

APPENDIX II: TABLE 42. Langbank sediment. Two-way anovar on suspended weight of wet sediment at 50% salinity.

Factor A: Different temperatures.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	5°C 10°C 20°C	0.001585	0.0007923	2	82.83	
B-factor	Time	0.002824	0.0005648	5	59.05	
Interaction		0.0008597	0.00008597	10	8.988	P < 0.001 *****
Error		0.0006887	0.000009565	72		
Total		0.005957		89		

APPENDIX II: TABLE 43. Langbank sediment. Two-way anovar on suspended weight of wet sediment at 100% salinity.

Factor A: Different temperatures

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	5°C 10°C 20°C	0.004592	0.002296	2	144.34	
B-factor	Time	0.008219	0.001644	5	103.35	
Interaction		0.001338	0.0001338	10	8.414	$P < 0.001$ *****
Error		0.001145	0.00001591	72		
Total		0.01529		89		

APPENDIX II: TABLE 44. Langbank sediment. Two-way anovar on suspended weight of dry sediment at 0% salinity.

Factor A: Different temperatures.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	$5^{o}C$ $10^{o}C$ $20^{o}C$	0.000003872	0.000001936	2	44.47	
B-factor	Time	0.00001038	0.000002075	5	47.68	
Interaction		0.000004379	0.0000004379	10	10.06	$P < 0.001$ *****
Error		0.000003134	0.00000004353	72		
Total		0.00002176		89		

APPENDIX II: TABLE 45. Langbank sediment. Two-way anovar on suspended weight of dry sediment at 50% salinity.

Factor A: Different temperatures.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	5°C 10°C 20°C	0.0004749	0.0002375	2	78.00	
B-factor	Time	0.0005554	0.0001111	5	36.49	
Interaction		0.0003114	0.00003114	10	10.23	P < 0.001 *****
Error		0.0002192	0.000003044	72		
Total		0.001561		89		

APPENDIX II: TABLE 46. Langbank sediment. Two-way anovar on suspended weight of dry sediment at 100% salinity.

Factor A: Different temperatures.

Factor B: Time intervals (5, 10, 20, 40, 60 and 120 seconds).

Factors		Sum of squares Ss	Mean squares Ss/D.F	D.F	F-ratio	Probability
A-factor	$5^{o}C$ $10^{o}C$ $20^{o}C$	0.0005794	0.0002897	2	92.85	
B-factor	Time	0.002265	0.0004531	5	145.20	
Interaction		0.0007171	0.00007171	10	22.98	$P < 0.001$ *****
Error		0.0002247	0.000003120	72		
Total		0.003787		89		

APPENDIX II: TABLE 47. Comparison of the effect of the three different temperatures on suspended weight (mg/ml) by one-way anovars. Wet Langbank sediment, 0% salinity. Main factor = 5, 10 and 20°C.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	59.40	29.70	2	81.28	$P < 0.001$
	Error	4.385	0.3654	12		
	Total	63.79		14		*****
10	Main	22.69	11.35	2	5.549	$0.025 > P > 0.01$
	Error	24.54	2.045	12		
	Total	47.23		14		**
20	Main	6.085	3.043	2	47.79	$P < 0.001$
	Error	0.7640	0.06367	12		
	Total	6.849		14		*****
40	Main	3.852	1.926	2	76.35	$P < 0.001$
	Error	0.3028	0.02523	12		
	Total	4.155		14		*****
60	Main	2.389	1.195	2	134.9	$P < 0.001$
	Error	0.1063	0.008854	12		
	Total	2.495		14		*****
120	Main	2.239	1.120	2	53.9	$P < 0.001$
	Error	0.02512	0.002093	12		
	Total	2.264		14		*****

APPENDIX II: TABLE 48. Comparison of the effect of the three different temperatures on suspended weight (mg/ml) by one-way anovars. Wet Langbank sediment, 50% salinity. Main factor: 5, 10 and 20°C.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	244.7	122.4	2	15.68	$P < 0.001$
	Error	93.64	7.804	12		
	Total	338.4		14		*****
10	Main	192.3	96.16	2	24.99	$P < 0.001$
	Error	46.17	3.837	12		
	Total	238.5		14		*****
20	Main	93.16	46.58	2	84.11	$P < 0.001$
	Error	6.646	0.5538	12		
	Total	99.80		14		*****
40	Main	69.49	34.74	2	16.81	$P < 0.001$
	Error	24.81	2.068	12		
	Total	94.30		14		*****
60	Main	7.089	3.545	2	243.4	$P < 0.001$
	Error	0.1748	0.01456	12		
	Total	7.264		14		*****
120	Main	4.378	2.189	2	38.79	$P < 0.001$
	Error	0.6772	0.05643	12		
	Total	5.055		14		*****

APPENDIX II: TABLE 49. Comparison of the effect of the three different temperatures on suspended weight (mg/ml) by one-way anovars. Wet Langbank sediment, 100% salinity. Main factor = 5, 10 and 20°C.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	465.9	233.0	2	32.95	P < 0.001
	Error	84.84	7.070	12		
	Total	550.8		14		*****
10	Main	284.1	142.1	2	19.84	P < 0.001
	Error	85.93	7.160	12		
	Total	370.0		14		*****
20	Main	296.4	148.2	2	32.92	P < 0.001
	Error	54.02	4.502	12		
	Total	350.4		14		*****
40	Main	236.9	118.4	2	102.8	P < 0.001
	Error	13.82	1.152	12		
	Total	250.7		14		*****
60	Main	136.2	68.11	2	25.97	P < 0.001
	Error	31.47	2.623	12		
	Total	167.7		14		*****
120	Main	98.72	49.36	2	18.93	P < 0.001
	Error	31.30	2.608	12		
	Total	130.0		14		*****

APPENDIX II: TABLE 50. Comparison of the effect of the three different temperatures on suspended weight (mg/ml) by one-way anovars. Dry Langbank sediment, 0% salinity. Main factor: 5, 10 and 20°C.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	88.84	44.42	2	114.9	$P < 0.001$
	Error	4.638	0.3865	12		
	Total	93.48		14		*****
10	Main	0.9566	0.4783	2	11.48	$0.005 > P > 0.001$
	Error	0.5002	0.04168	12		
	Total	1.457		14		****
20	Main	0.05856	0.02928	2	24.61	$P < 0.001$
	Error	0.01428	0.001190	12		
	Total	0.07284		14		*****
40	Main	0.05714	0.02857	2	66.06	$P < 0.001$
	Error	0.005190	0.0004325	12		
	Total	0.06233		14		*****
60	Main	0.04838	0.02419	2	58.61	$P < 0.001$
	Error	0.004953	0.0004128	12		
	Total	0.05334		14		*****
120	Main	0.0000	0.0	2	0	$P > 0.75$
	Error	0.0001944	0.00001620	12		
	Total	0.0001944		14		

APPENDIX II: TABLE 51. Comparison of the effect of the three different temperatures on suspended weight (mg/ml) by one-way anovars. Dry Langbank sediment, 50% salinity. Main factor = 5, 10 and 20°C.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	76.94	38.47	2	45.20	$P < 0.001$
	Error	10.21	0.8511	12		
	Total	87.16		14		******
10	Main	73.30	36.65	2	10.92	$0.005 > P > 0.001$
	Error	40.27	3.356	12		
	Total	113.6		14		*****
20	Main	30.27	15.13	2	57.36	$P < 0.001$
	Error	3.166	0.2638	12		
	Total	33.43		14		******
40	Main	15.56	7.779	2	81.07	$P < 0.001$
	Error	1.152	0.09596	12		
	Total	16.71		14		******
60	Main	0.000750	0.0003750	2	0.3913	$0.75 > P > 0.50$
	Error	0.01150	0.0009583	12		
	Total	0.01225		14		
120	Main	0.1165	0.05823	2	73.32	$P < 0.001$
	Error	0.009530	0.0007942	12		
	Total	0.1260		14		*****

APPENDIX II: TABLE 52. Comparison of the effect of the three different temperatures on suspended weight (mg/ml) by one-way anovars. Dry Langbank sediment, 100% salinity. Main factor: 5, 10 and 20°C.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	177.2	88.60	2	26.78	$P < 0.001$
	Error	39.70	3.308	12		
	Total	216.9		14		*****
10	Main	55.51	17.76	2	25.72	$P < 0.001$
	Error	12.95	1.079	12		
	Total	68.46		14		*****
20	Main	72.39	36.19	2	538.9	$P < 0.001$
	Error	0.8060	0.06717	12		
	Total	73.19		14		*****
40	Main	17.34	8.672	2	42.73	$P < 0.001$
	Error	2.436	0.2030	12		
	Total	19.78		14		*****
60	Main	1.120	0.5600	2	32.90	$P < 0.001$
	Error	0.2043	0.01702	12		
	Total	1.324		14		*****
120	Main	0.4983	0.2491	2	225.6	$P < 0.001$
	Error	0.01325	0.001104	12		
	Total	0.5115		14		*****

APPENDIX II: TABLE 53. Comparison of the suspended sediment (mg/ml) at the six different time intervals by one-way anovars. Langbank sediment: 5°C.

Salinity	Sediment	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
0%	Wet	Main	39.30	7.861	5	338.1	P < 0.001
		Error	0.5580	0.02325	24		
		Total	39.86		29		*****
	Dry	Main	1.257	0.2514	5	46.11	P < 0.001
		Error	0.1308	0.005452	24		
		Total	1.388		29		*****
50%	Wet	Main	506.4	101.3	5	72.68	P < 0.001
		Error	33.44	1.393	24		
		Total	539.8		29		*****
	Dry	Main	17.57	3.513	5	205.5	P < 0.001
		Error	0.4103	0.01709	24		
		Total	17.98		29		*****
100%	Wet	Main	1278.2	255.6	5	104.9	P < 0.001
		Error	58.47	2.436	24		
		Total	1336.7		29		*****
	Dry	Main	263.5	52.69	5	86.05	P < 0.001
		Error	14.70	0.6124	24		
		Total	278.2		29		*****

APPENDIX II: TABLE 54. Comparison of the suspended sediment (mg/ml) at the six different time intervals by one-way anovars. Langbank sediment: 10°C.

Salinity	Sediment	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
0%	Wet	Main	117.5	23.50	5	19.09	P < 0.001
		Error	29.54	1.231	24		
		Total	147.1		29		*****
	Dry	Main	2.409	0.4817	5	17.74	P < 0.001
		Error	0.6517	0.02715	24		
		Total	3.060		29		*****
50%	Wet	Main	396.0	79.19	5	13.72	P < 0.001
		Error	138.5	5.773	24		
		Total	534.5		29		*****
	Dry	Main	192.0	38.41	5	16.95	P < 0.001
		Error	54.39	2.266	24		
		Total	246.4		29		*****
100%	Wet	Main	820.1	164.0	5	18.15	P < 0.001
		Error	216.9	9.038	24		
		Total	1037.0		29		*****
	Dry	Main	451.9	90.37	5	52.83	P < 0.001
		Error	41.05	1.711	24		
		Total	492.9		29		*****

APPENDIX II: TABLE 55. Comparison of the suspended sediment (mg/ml) at the six different time intervals by one-way anovars. Langbank sediment: 20°C.

Salinity	Sediment	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
0%	Wet	Main	3.329	0.6659	5	961.5	P < 0.001
		Error	0.01662	0.0006925	24		
		Total	3.346		29		*****
	Dry	Main	0.02318	0.004636	5	111.3	P < 0.001
		Error	0.0009996	0.00004165	24		
		Total	0.02418		29		*****
50%	Wet	Main	18.61	3.721	5	485.2	P < 0.001
		Error	0.1841	0.007670	24		
		Total	18.79		29		*****
	Dry	Main	6.986	1.397	5	1785.4	P < 0.001
		Error	0.01878	0.0007825	24		
		Total	7.004		29		*****
100%	Wet	Main	246.8	49.36	5	45.28	P < 0.001
		Error	26.16	1.090	24		
		Total	273.0		29		*****
	Dry	Main	30.35	6.070	5	350.0	P < 0.001
		Error	0.4163	0.01734	24		
		Total	30.77		29		*****

APPENDIX II: TABLE 56. Application of three equations to the data of the suspended weights obtained at the three different temperatures, three different salinities, and wet and dry Langbank sediment to obtain the best fit.

Factors			$y = a + bx$			$y = ae^{bx}$			$y = ax^{b}$		
Temperature	Salinity	Sediment type	Equation	R	R rank	Equation	R	R rank	Equation	R	R rank
5°C	0‰	Wet	$y = 3.029 - 0.02289X$	-0.7813	3	$\ln y = 1.108 + 0.01185X$	-0.8589	2	$y = 9.108X^{-0.4943}$	-0.9779	1
		Dry	$y = 0.4534 - 0.004331X$	-0.7928	3	$\ln y = -0.3086 - 0.03962X$	-0.9507	1	$y = 8.191X^{-1.262}$	-0.8266	2
	50‰	Wet	$y = 7.757 - 0.08208X$	-0.7613	3	$\ln y = 2.414 - 0.04525X$	-0.9907	1	$y = 265.8X^{-1.568}$	-0.9375	2
		Dry	$y = 1.462 - 0.01394X$	-0.7086	3	$\ln y = 0.2408 - 0.01909X$	-0.8035	2	$y = 8.482X^{-0.8343}$	-0.9585	1
	100‰	Wet	$y = 14.12 - 0.1429X$	-0.8425	3	$\ln y = 2.869 - 0.03692X$	-0.9369	1	$y = 258.5X^{-1.307}$	-0.9110	2
		Dry	$y = 7.102 - 0.06706X$	-0.8665	3	$\ln y = 2.136 - 0.02654X$	-0.9617	1	$y = 57.06X^{-0.9352}$	-0.9253	2
10°C	0‰	Wet	$y = 3.609 - 0.03666X$	-0.6514	3	$\ln y = 1.177 - 0.02503X$	-0.8714	2	$y = 30.14X^{-1.013}$	-0.9630	1
		Dry	$y = 0.4694 - 0.005107X$	-0.6294	3	$\ln y = -0.7981 - 0.04127X$	-0.8706	2	$y = 13.32X^{-1.595}$	-0.8749	1
	50‰	Wet	$y = 9.634 - 0.08334X$	-0.7768	3	$\ln y = 2.345 - 0.02016X$	-0.9013	1	$y = 45.39X^{-0.7169}$	-0.8749	2
		Dry	$y = 5.531 - 0.05596X$	-0.7681	3	$\ln y = 2.112 - 0.04409X$	-0.9603	1	$y = 162.8X^{-1.509}$	-0.8810	2
	100‰	Wet	$y = 16.33 - 0.1078X$	-0.7218	3	$\ln y = 2.788 - 0.0111X$	-0.7531	2	$y = 41.71X^{-0.4351}$	-0.8090	1
		Dry	$y = 5.816 - 0.06321X$	-0.6136	3	$\ln y = 1.702 - 0.03648X$	-0.9201	2	$y = 109.4X^{-1.399}$	-0.9637	1
20°C	0‰	Wet	$y = 0.7429 - 0.00249X$	-0.8540	3	$\ln y = -0.08059 - 0.02979X$	-0.9704	1	$y = 7.967X^{-1.055}$	-0.9383	2
		Dry	$y = 0.06695 - 6.036X$	-0.8420	3	$\ln y = -2.519 - 0.02538X$	-0.9113	1	$y = 0.4804X^{-0.8815}$	-0.8666	2
	50‰	Wet	$y = 1.740 - 1.697X$	-0.8437	3	$\ln y = 0.8594 - 0.03239X$	-0.9956	1	$y = 21.29X^{-1.101}$	-0.9242	2
		Dry	$y = 1.024 - 0.01016X$	-0.8269	3	$\ln y = 0.4708 - 0.03958X$	-0.9885	1	$y = 20.49X^{-1.303}$	-0.8887	2
	100‰	Wet	$y = 5.270 - 0.05581X$	-0.7279	3	$\ln y = 1.902 - 0.04053X$	-0.9800	1	$y = 129.1X^{-1.441}$	-0.9516	2
		Dry	$y = 2.075 - 0.02104X$	-0.8174	3	$\ln y = 1.070 - 0.03757X$	-0.9887	1	$y = 38.56X^{-1.287}$	-0.9249	2

APPENDIX II

Methods of sedimentation size analysis

There are several different methods of sedimentation size analysis (Allen, 1975; Dyer, 1979). These methods are as follows.

1. The pipette method

In the pipette method of particle size analysis, the concentration changes occurring with a settling suspension are followed by drawing off definite volumes by means of a pipette. The concentration of solids in the samples may be determined by centrifugation, drying and weighing or simply drying and weighing. The drying temperature should not be too high or spitting and subsequent loss of powder may occur. With hygroscopic dispersing agents, special care must be taken to eliminate uptake of moisture from the atmosphere as the container cools. This method has been explained in detail by Allen, 1975, p. 193; Dyer, 1979, p. 102; Galehouse, 1971, pp. 79-94.

In my study, I used a modified version of the pipette method.

2. The photosedimentation technique

The photosedimentometer combines gravitational settling with photoelectric measurement. The principle of the technique is that a narrow horizontal beam of parallel light is projected through a suspension at a known depth (h) on to a photocell. Assuming an initially homogenous suspension, the concentration of particles in the light beam will be the same as the concentration in the suspension. If the particles are allowed to settle, the number of particles leaving the light beam will be balanced by the number entering it from above. However, after the largest particle present in the suspension, d_m has fallen from the surface to the measurement zone the emergent light flux will begin to increase since there will be no more particles of this

size entering the measurement zone from above. Hence, the concentration of particles in the light beam at any time, t, will be the concentration of particles smaller than d_{st}, where d_{st} is given by Stokes' Law, d_{st} is the Stokes' diameter.

3. X-ray sedimentation

In this method, an instrument employing the X-ray absorption technique with a special programme for scanning the sedimentation tank. In this case the X-ray density is proportional to the weight of powder in the beam (see Allen, 1975, pp. 206-210 for details).

4. Hydrometers

The variation in density of a settling suspension may be followed with a hydrometer. The suspension is made up with a known amount of powder and thoroughly agitated, usually by shaking. The container is then placed in a thermostat and the change in density of the suspension at known depths recorded as the solid settles out (see Allen, 1975, pp. 210-212 and Dyer, 1979, p. 106 for details).

5. Divers

This method is an extension of the hydrometer technique. Two types of divers were designed, the first for gravitational and the second for centrifugal sedimentation. A number of divers are required since each one gives only one point on the size distribution curve (see Allen, 1975, pp. 212-214 for details).

6. The specific gravity balance

In this method, the changes in density within a settling suspension may be followed using a specific gravity balance (see Allen, 1975, p. 214 for details).

7. Coulter counter

Coulter counter provides a very detailed analysis of the grain size present in a sediment sample (see Dyer, 1979, p. 109).

A review of size analysis of fine-grained suspended sediments is also described in Swift et al. (1972).

APPENDIX III

APPENDIX III: TABLE 1. The sequence of removing the 2 x 6 replicate samples from each cylinder in the scaled down sedimentation experiment. Each column represents one cylinder containing sediment and secretions digested by one enzyme. The numbers in the columns of the table are random numbers whose sequence was obtained from Rohlf and Sokal (1969, Table O , p. 153).

Time (secs)	Replicate	Cylinders					
		α-amylase	Hyaluronidase	Lipase	Lysozyme	Pepsin	Trypsin
5	a	7	7	11	10	5	5
	b	12	2	7	2	2	1
10	a	4	10	8	7	7	4
	b	1	1	5	6	6	3
20	a	3	3	6	11	3	12
	b	5	8	4	9	4	6
40	a	9	11	10	1	10	2
	b	11	5	9	8	8	7
60	a	6	4	2	12	9	8
	b	8	6	1	4	12	9
120	a	10	9	12	3	11	10
	b	2	12	3	5	1	11

APPENDIX III: TABLE 2. Means and standard deviations of suspended weights (mg/ml) of Langbank (LBM) and Rockware (RWS) sediments without (control) and with (Corophium volutator, Nereis diversicolor and mixed) animals at different time intervals.

Sediment type	LBM						RWS					
	5 secs	10 secs	20 secs	40 secs	1 min	2 min	5 secs	10 secs	20 secs	40 secs	1 min	2 min
Control	50.15 ± 0.03962	49.37 ± 0.04970	20.59 ± 0.05805	4.975 ± 0.03953	2.550 ± 0.07289	1.775 ± 0.01768	49.83 ± 0.05595	31.78 ± 0.07950	5.275 ± 0.07289	4.925 ± 0.03953	2.150 ± 0.03953	1.020 ± 0.03708
With C. volutator	94.78 ± 0.05595	70.03 ± 0.01789	61.58 ± 0.07906	52.87 ± 0.1322	50.03 ± 0.2828	20.63 ± 0.09017	62.83 ± 0.06380	50.35 ± 0.07071	48.93 ± 0.05595	36.59 ± 0.1545	21.65 ± 0.06380	7.825 ± 0.08839
With N. diversicolor	122.8 ± 0.07071	110.3 ± 0.1140	100.1 ± 0.04416	89.28 ± 0.05310	67.23 ± 0.04550	45.63 ± 0.08843	92.78 ± 0.05595	80.03 ± 0.01789	64.78 ± 0.03962	50.15 ± 0.05595	38.88 ± 0.01789	15.03 ± 0.03962
With C. volutator and N. diversicolor	144.3 ± 0.08367	128.0 ± 0.03421	100.2 ± 0.01789	99.38 ± 0.03962	73.31 ± 0.02775	51.02 ± 0.03782	123.0 ± 0.04472	112.3 ± 0.07071	69.03 ± 0.06573	50.33 ± 0.05595	48.28 ± 2.420	22.53 ± 0.07930

APPENDIX III: TABLE 3. The ln values of suspended weights (mg/ml) of Langbank (LBM) and Rockware (RWS) sediments without (control) and with (C. volutator, N. diversicolor and mixed) animals at six time intervals.

Sediment type	LBM						RWS					
	Time (secs)						Time (secs)					
	5	10	20	40	60	120	5	10	20	40	60	120
Control	3.915	3.899	3.025	1.604	0.9361	0.5738	3.909	3.459	1.663	1.594	0.7655	0.01980
With C. volutator	4.552	4.249	4.120	3.968	3.913	3.027	4.140	3.919	3.890	3.600	3.075	2.057
With N. diversicolor	4.811	4.703	4.606	4.492	4.208	3.821	4.530	4.382	4.171	3.915	3.660	2.710
With mixed C. volutator and N. diversicolor	4.972	4.852	4.607	4.599	4.295	3.932	4.812	4.721	4.235	3.919	3.877	3.115

APPENDIX III: TABLE 4. Means and standard deviations of suspended weights (mg/ml) of Ardmore (ARD) and Rockware (RWS) sediments without (control) and with (Pygospio elegans, Scoloplos armiger and Arenicola marina) animals at different time intervals.

Sediment type	ARD						RWS					
	5 secs	10 secs	20 secs	40 secs	60 secs	120 secs	5 secs	10 secs	20 secs	40 secs	60 secs	120 secs
Control	50.03 ± 0.1869	43.80 ± 7.150	23.25 ± 4.444	5.035 ± 0.2240	2.315 ± 0.2219	1.185 ± 0.2020	49.83 ± 0.02881	31.78 ± 0.08258	5.275 ± 0.05303	4.925 ± 0.03536	2.150 ± 0.01768	1.020 ± 0.02735
Pygospio	94.73 ± 0.05595	64.40 ± 0.1031	48.75 ± 0.09524	22.75 ± 0.05550	8.250 ± 0.03953	2.925 ± 0.03536	89.25 ± 0.03962	54.98 ± 0.05595	44.33 ± 0.04817	18.28 ± 0.06380	4.975 ± 0.05590	2.375 ± 0.06374
Scoloplos	50.07 ± 0.03114	45.25 ± 0.1768	23.30 ± 0.06380	4.999 ± 0.002236	2.625 ± 0.007906	1.300 ± 0.07289	49.83 ± 0.5819	31.80 ± 0.06380	5.300 ± 0.1132	4.950 ± 0.03953	2.200 ± 0.05590	1.070 ± 0.0326
Arenicola	122.8 ± 0.1140	93.75 ± 0.05595	51.60 ± 0.2904	48.25 ± 0.03962	26.25 ± 0.08843	4.375 ± 0.06374	97.78 ± 0.05595	83.23 ± 0.05595	49.88 ± 0.03962	33.13 ± 0.09017	15.88 ± 0.05595	2.825 ± 0.0559

APPENDIX III: TABLE 5. The ln values of suspended weights (mg/ml) of Ardmore (ARD) and Rockware (RWS) sediments without (control) and with (Pygospio elegans, Scoloplos armiger and Arenicola marina) animals at six time intervals.

Experiment	ARD						RWS					
	Time (secs)						Time (secs)					
	5	10	20	40	60	120	5	10	20	40	60	120
Control	3.913	3.780	3.146	1.616	0.8394	0.1697	3.909	3.459	1.663	1.594	0.7655	0.01980
With Pygospio	4.551	4.165	3.887	3.125	2.110	1.073	4.491	4.007	3.792	2.906	1.604	0.8650
With Scoloplos	3.913	3.812	3.148	1.609	0.9651	0.2624	3.909	3.459	1.668	1.599	0.7885	0.06766
With Arenicola	4.811	4.541	3.944	3.876	3.268	1.476	4.583	4.422	3.910	3.500	2.765	1.039

APPENDIX III: TABLE 6. Statistical analysis of suspended sediment (mg/ml) in experiments testing the effect of animal secretion on sedimentation (Rockware sediment containing Langbank and Ardmore species). Six 1 x 2 one-way analyses of variance each comparing sediment containing C. volutator secretions, sediment containing N. diversicolor secretions, sediment containing P. elegans secretions and sediment containing A. marina secretions. Data for the 5-second time interval.

Comparison	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
C. volutator	Main	2242.2	2242.2	1	622835.2	$P < 0.001$
x	Error	0.02880	0.003600	8		
N. diversicolor	Total	2242.2		9		*****
C. volutator	Main	1745.6	1745.6	1	618996.3	$P < 0.001$
x	Error	0.02256	0.002820	8		
P. elegans	Total	1745.6		9		*****
C. volutator	Main	3053.4	3053.4	1	848168.5	$P < 0.001$
x	Error	0.02880	0.003600	8		
A. marina	Total	3053.4		9		*****
N. diversicolor	Main	31.05	31.05	1	13211.3	$P < 0.001$
x	Error	0.01880	0.00235	8		
P. elegans	Total	31.07		9		*****
N. diversicolor	Main	62.50	62.50	1	19968.1	$P < 0.001$
x	Error	0.02504	0.003130	8		
A. marina	Total	62.53		9		*****
P. elegans	Main	181.6	181.6	1	77296.4	$P < 0.001$
x	Error	0.01880	0.002350	8		
A. marina	Total	181.7		9		*****

APPENDIX III: TABLE 7. Statistical analysis of suspended sediment (mg/ml) in experiments testing the effect of animal secretions on sedimentation (Rockware sediment containing Langbank and Ardmore species). Six 1 x 2 one-way analyses of variance each comparing sediment containing C. volutator secretions, sediment containing N. diversicolor secretions, sediment containing P. elegans secretions and sediment containing A. marina secretions. Data for the 10-second time interval.

Comparison	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
C. volutator x N. diversicolor	Main	2202.0	2202.0	1	827804.2	P < 0.001
	Error	0.02128	0.002660	8		
	Total	2202.0		9		*****
C. volutator x P. elegans	Main	53.50	53.50	1	13161.1	P < 0.001
	Error	0.03252	0.004065	8		
	Total	53.53		9		*****
C. volutator x A. marina	Main	2702.1	2702.1	1	664717.9	P < 0.001
	Error	0.03252	0.004065	8		
	Total	2702.1		9		*****
N. diversicolor x P. elegans	Main	1569.01	1569.0	1	909569.1	P < 0.001
	Error	0.01380	0.001715	8		
	Total	1569.02		9		*****
N. diversicolor x A. marina	Main	25.89	25.89	1	31380.4	P < 0.001
	Error	0.006600	0.0008250	8		
	Total	25.90		9		*****
P. elegans x A. marina	Main	1995.2	1995.2	1	637430.1	P < 0.001
	Error	0.02504	0.003130	8		
	Total	1995.2		9		*****

APPENDIX III: TABLE 8. Statistical analysis of suspended sediment (mg/ml) in experiments testing the effect of animal secretions on sedimentation (Rockware sediment containing Langbank and Ardmore species). Six 1 x 2 one-way analyses of variance each comparing sediment containing C. volutator secretions, sediment containing N. diversicolor secretions, sediment containing P. elegans secretions, and sediment containing A. marina secretions. Data for the 20-second time interval.

Comparison	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
C. volutator	Main	628.2	628.2	1	267325.4	P < 0.001
x	Error	0.01880	0.002350	8		
N. diversicolor	Total	628.2		9		*****
C. volutator	Main	52.85	52.85	1	19396.0	P < 0.001
x	Error	0.02180	0.002725	8		
P. elegans	Total	52.88		9		*****
C. volutator	Main	2.266	2.266	1	964.2	P < 0.001
x	Error	0.01880	0.002350	8		
A. marina	Total	2.285		9		*****
N. diversicolor	Main	1045.5	1045.5	1	537535.3	P < 0.001
x	Error	0.01556	0.001945	8		
P. elegans	Total	1045.5		9		*****
N. diversicolor	Main	555.03	555.03	1	353519.1	P < 0.001
x	Error	0.01256	0.001570	8		
A. marina	Total	555.04		9		*****
P. elegans	Main	77.01	77.01	1	39591.9	P < 0.001
x	Error	0.01556	0.001945	8		
A. marina	Total	77.01		9		*****

APPENDIX III: TABLE 9. Statistical analysis of suspended sediment (mg/ml) in experiments testing the effect of animal secretions on sedimentation (Rockware sediment containing Langbank and Ardmore species). Six 1 x 2 one-way analyses of variance each comparing sediment containing C. volutator secretions, sediment containing N. diversicolor secretions, sediment containing P. elegans secretions and sediment containing A. marina secretions. Data for the 40-second time interval.

Comparison	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
C. volutator	Main	460.1	460.1	1	34080.8	$P < 0.001$
x	Error	0.1080	0.01350	8		
N. diversicolor	Total	460.2		9		*****
C. volutator	Main	838.1	838.1	1	59995.7	$P < 0.001$
x	Error	0.1118	0.01397	8		
P. elegans	Total	838.3		9		*****
C. volutator	Main	29.96	29.96	1	1872.7	$P < 0.001$
x	Error	0.1280	0.01600	8		
A. marina	Total	30.09		9		*****
N. diversicolor	Main	2540.2	2540.2	1	705610.7	$P < 0.001$
x	Error	0.0288	0.003600	8		
P. elegans	Total	2540.2		9		*****
N. diversicolor	Main	724.9	724.9	1	128753.5	$P < 0.001$
x	Error	0.04504	0.005630	8		
A. marina	Total	724.9		9		*****
P. elegans	Main	551.2	551.16	1	90353.7	$P < 0.001$
x	Error	0.04880	0.006100	8		
A. marina	Total	551.2		9		*****

APPENDIX III: TABLE 10. Statistical analysis of suspended sediment (mg/ml) in experiment testing the effect of animal secretions on sedimentation (Rockware sediment containing Langbank and Ardmore species). Six 1 x 2 one-way analyses of variance each comparing sediment containing C. volutator secretions, sediment containing N. diversicolor secretions, sediment containing P. elegans secretions and sediment containing A. marina secretions. Data for the 60-second time interval.

Comparison	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
C. volutator x N. diversicolor	Main	741.8	741.8	1	337967.1	$P < 0.001$
	Error	0.01756	0.002195	8		
	Total	741.9		9		*****
C. volutator x P. elegans	Main	695.3	695.30	1	193274.7	$P < 0.001$
	Error	0.02878	0.005398	8		
	Total	695.33		9		*****
C. volutator x A. marina	Main	83.41	83.41	1	23168.2	$P < 0.001$
	Error	0.0288	0.003600	8		
	Total	83.43		9		*****
N. diversicolor x P. elegans	Main	2873.5	2873.5	1	1668234.3	$P < 0.001$
	Error	0.01378	0.001723	8		
	Total	2873.5		9		*****
N. diversicolor x A. marina	Main	1322.7	1322.7	1	766800.0	$P < 0.001$
	Error	0.01380	0.001725	8		
	Total	1322.7		9		*****
P. elegans x A. marina	Main	297.08	297.08	1	94989.4	$P < 0.001$
	Error	0.02502	0.003128	8		
	Total	297.1		9		*****

APPENDIX III: TABLE 11. Statistical analysis of suspended sediment (mg/ml) in experiments testing the effect of animal secretions on sedimentation (Rockware sediment containing Langbank and Ardmore species). Six 1 x 2 one-way analyses of variance each comparing sediment containing C. volutator secretions, sediment containing N. diversicolor secretions, sediment containing P. elegans secretions and sediment containing A. marina secretions. Data for the 120-second time interval.

Comparison	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
C. volutator	Main	129.7	129.7	1	27648.9	$P < 0.001$
x	Error	0.03753	0.004691	8		
N. diversicolor	Total	129.74		9		*****
C. volutator	Main	74.26	74.26	1	12506.3	$P < 0.001$
x	Error	0.04750	0.005938	8		
P. elegans	Total	74.30		9		*****
C. volutator	Main	62.50	62.50	1	11428.6	$P < 0.001$
x	Error	0.04375	0.005469	8		
A. marina	Total	62.54		9		*****
N. diversicolor	Main	400.25	400.25	1	142120.2	$P < 0.001$
x	Error	0.02253	0.002816	8		
P. elegans	Total	400.27		9		*****
N. diversicolor	Main	372.28	372.28	1	158587.0	$P < 0.001$
x	Error	0.01878	0.002348	8		
A. marina	Total	372.3		9		*****
P. elegans	Main	0.5063	0.5063	1	140.9	$P < 0.001$
x	Error	0.02875	0.003594	8		
A. marina	Total	0.5350		9		*****

APPENDIX III: TABLE 12. Effect of 3 and 5 buffer washes on enzymic digestion of C. volutator and N. diversicolor secretions. The weights remaining after enzymic digestion are expressed as a fraction of the mean of controls. Arcsine values of these fractions were obtained from Table K in Rohlf and Sokal (1969, pp. 129-135). Two matched t-tests were applied to the arcsine data, one for each species. The paired x, y values were the 3 and 5 wash readings for each enzyme in the first and second experiments (6 + 6 = 12 paired readings in each matched t-test).

Species	Enzymes	First experiment				Second experiment			
		3 washes		5 washes		3 washes		5 washes	
		Weight	Arcsine	Weight	Arcsine	Weight	Arcsine	Weight	Arcsine
C. volutator	α-amylase	0.2819	32.08°	0	0°	0.1913	25.99°	0	0°
	Hyaluronidase	0.3376	35.55°	0.01709	7.51°	0.3482	36.15°	0.01811	7.73°
	Lipase	0.4115	39.93°	0.06819	15.13°	0.4819	43.97°	0.08311	16.75°
	Lysozyme	0.3014	33.34°	0.03512	10.79°	0.3026	33.40°	0.03369	10.63°
	Pepsin	0.4714	43.39°	0.02192	8.53°	0.2824	32.08°	0.01640	7.32°
	Trypsin	0.1008	18.53°	0	0°	0.08719	17.15°	0	0°
N. diversicolor	α -amylase	0.2427	29.53°	0.003192	3.24°	0.1407	22.06°	0	0°
	Hyaluronidase	0.1643	23.89°	0.1607	23.66°	0.06754	15.12°	0.1966	26.35°
	Lipase	0.1246	20.70°	0.01855	7.920°	0.1217	20.44°	0.03555	10.94°
	Lysozyme	0.1318	21.30°	0.006921	4.760°	0.1864	25.55°	0.01306	6.55°
	Pepsin	0.1511	22.87°	0.003249	3.240°	0.2224	28.11°	0.004612	3.89°
	Trypsin	0.1143	19.73°	0.03576	10.94°	0.1502	22.79°	0.03898	11.39°

Matched t-test	Factors	Paired t	D.F	Probability
	C. volutator	17.44	11	$P < 0.001$ *****
	N. diversicolor	4.296	11	$0.01 > P > 0.005$ *****

APPENDIX III: TABLE 13. Effect of enzymes on secretions of C. volutator and N. diversicolor, mg/g total weight (60°C) dried sand. mg/g column represents the weights of secretions remaining after enzymic digestion. % column represents weights of secretions remaining after enzymic digestion as a percentage of the mean of the control. Mean % column represent the mean of the percentages in Experiments 1 and 2.

	Treatments	C. volutator					N. diversicolor				
		Experiment 1		Experiment 2		Mean % of Exps 1 and 2	Experiment 1		Experiment 2		Mean % of Exps 1 and 2
		mg/g	%	mg/g	%		mg/g	%	mg/g	%	
Enzymes	∝ -amylase	0	0	0	0	0	0.6055	0.3192	0	0	0.1596
	Hyaluronidase	1.281	1.709	2.563	1.811	1.760	30.48	16.07	34.85	19.66	17.87
	Lipase	5.111	6.819	11.76	8.311	7.565	3.519	1.855	6.303	3.555	2.705
	Lysozyme	2.632	3.512	4.767	3.369	3.441	1.313	0.6921	2.316	1.306	0.9991
	Pepsin	1.643	2.192	2.320	1.640	1.916	0.6164	0.3249	0.8177	0.4612	0.3931
	Trypsin	0	0	0	0	0	6.784	3.576	6.912	3.898	3.737
Controls	20°C, pH 2.6	64.99		133.4			119.8		126.3		
	20°C, pH 7.6	76.72		186.9			284.4		191.8		
	37°C, pH 2.6	64.12		143.7			127.4		186.1		
	37°C, pH 7.6	93.97		101.8			227.1		204.8		
	Means ± S.D	74.95 ± 13.92		141.5 ± 35.16			189.7 ± 79.86		177.3 ± 34.86		

APPENDIX III: TABLE 14. Effect of enzymes on secretions of P. elegans and A. marina, mg/g total weight (60°C) dried sand. mg/m column represents the weights of secretions remaining after enzymic digestion. % column represents weights of secretions remaining after enzymic digestion as a percentage of the mean of the control. Mean % column represents the mean of the percentages in Experiments 1 and 2.

	Treatments	P. elegans					A. marina				
		Experiment 1		Experiment 2		Mean % of Exps 1 and 2	Experiment 1		Experiment 2		Mean % of Exps 1 and 2
		mg/g	%	mg/g	%		mg/g	%	mg/g	%	
Enzymes	∝ -amylase	0.9123	5.951	0.8221	6.334	6.143	7.097	16.14	7.092	16.59	16.37
	Hyaluronidase	5.670	36.99	5.493	42.32	39.66	24.48	55.66	30.15	70.54	63.10
	Lipase	0.2966	1.935	0.2984	2.299	2.117	10.74	24.42	17.31	40.50	32.46
	Lysozyme	1.540	10.05	1.707	13.15	11.60	14.80	33.65	15.29	35.77	34.71
	Pepsin	2.581	16.84	2.754	21.22	19.03	9.205	20.93	9.694	22.68	21.68
	Trypsin	4.191	27.34	3.766	29.01	28.18	31.68	72.03	40.61	95.02	83.53
Controls	20°C, pH 2.6	15.02		15.23			52.43		49.36		
	20°C, pH 7.6	19.92		10.12			29.66		28.93		
	37°C, pH 2.6	16.76		17.19			27.50		27.87		
	37°C, pH 7.6	9.636		9.396			66.34		64.78		
	Means ± S.D	15.33 ± 4.306		12.98 ± 3.821			43.98 ± 18.69		42.74 ± 17.71		

APPENDIX III: TABLE 15. Suspended weights (mg/ml) of Rockware sediment with secretion from C. volutator after enzymes treatment at six different time intervals (5, 10, 20, 40, 60 and 120 seconds) in the sedimentation cylinder. The suspended weights of two control sediments are also present. R = replicates.

Factors	R	Time (secs)					
		5	10	20	40	60	120
Control (with secretion)	R_1	62.75	59.73	48.75	38.90	21.55	7.825
	R_2	62.80	59.58	48.65	38.70	21.60	7.825
α-amylase	R_1	49.73	47.03	25.73	15.00	4.925	1.025
	R_2	49.98	47.13	25.78	15.00	4.975	1.075
Hyaluronidase	R_1	51.08	50.00	39.98	17.00	16.00	2.050
	R_2	51.08	50.05	40.03	17.05	15.95	2.150
Lipase	R_1	57.78	56.05	44.95	34.75	24.13	7.650
	R_2	57.83	56.20	45.00	34.65	24.38	7.450
Lysozyme	R_1	55.45	55.03	43.15	29.23	21.55	6.000
	R_2	55.50	55.08	43.40	29.28	21.60	6.050
Pepsin	R_1	53.03	50.48	42.13	23.20	20.98	5.025
	R_2	53.08	50.53	42.38	23.25	21.05	5.075
Trypsin	R_1	49.88	48.00	36.15	15.00	12.50	1.200
	R_2	49.88	48.05	36.10	15.05	12.55	0.9500
Control (without secretion)	R_1	49.78	31.60	5.250	4.975	2.050	0.9250
	R_2	49.78	31.65	5.350	4.825	2.100	0.9750

APPENDIX III: TABLE 16. Suspended weights (mg/ml) of Rockware sediment with N. diversicolor secretions after enzymes treatment at six different time intervals (5, 10, 20, 40, 60 and 120 seconds) in the sedimentation cylinder. The suspended weights of two control sediments are also present. R = replicate.

Factors	R	Time (secs)					
		5	10	20	40	60	120
Control (with secretion)	R_1	92.75	82.55	64.70	50.05	38.75	15.00
	R_2	92.85	82.68	64.80	50.28	38.95	15.00
α-amylase	R_1	49.95	38.63	28.05	21.13	6.450	1.075
	R_2	50.00	38.73	28.10	21.08	6.500	1.225
Hyaluronidase	R_1	81.00	71.90	55.55	50.05	38.68	14.68
	R_2	81.00	72.00	55.70	50.20	38.88	14.83
Lipase	R_1	55.35	55.03	54.98	49.63	20.25	10.50
	R_2	55.45	55.08	50.00	49.88	20.30	10.55
Lysozyme	R_1	50.65	50.10	50.00	49.50	19.95	5.000
	R_2	50.55	50.20	50.05	49.55	20.00	5.050
Pepsin	R_1	50.35	50.03	49.75	43.95	11.90	4.600
	R_2	50.45	50.13	49.90	43.70	12.05	4.900
Trypsin	R_1	65.70	61.75	55.53	50.00	31.55	11.95
	R_2	65.80	61.90	55.53	50.10	31.60	12.15
Control (without secretion)	R_1	49.75	33.45	7.925	4.925	2.050	1.000
	R_2	49.80	33.50	7.725	4.875	2.200	0.9500

APPENDIX III: TABLE 17. Suspended weights (mg/ml) of Rockware sediment with secretion of P. elegans after enzymes treatment at six different time intervals (5, 10, 20, 40, 60 and 120 seconds) in the sedimentation cylinder. The suspended weights of two control sediments are also present. R = replicates.

Factors	R	Time (secs)					
		5	10	20	40	60	120
Control (with secretion)	R_1	89.25	74.00	54.10	20.20	5.050	2.375
	R_2	89.30	75.46	54.40	20.28	4.975	2.425
α-amylase	R_1	50.30	44.38	21.53	9.975	3.675	0.5000
	R_2	50.20	44.25	21.50	9.900	3.700	0.5500
Hyaluronidase	R_1	83.28	64.98	50.95	19.85	3.020	2.375
	R_2	83.23	64.90	50.85	19.75	3.036	2.325
Lipase	R_1	49.98	33.88	11.68	5.025	3.975	1.050
	R_2	49.98	33.80	11.08	5.000	3.750	1.000
Lysozyme	R_1	50.00	49.98	32.83	16.03	4.975	0.8500
	R_2	50.00	49.95	32.75	16.05	4.950	0.9000
Pepsin	R_1	68.00	50.05	48.75	18.83	4.625	1.675
	R_2	68.05	50.03	48.68	18.70	4.575	1.675
Trypsin	R_1	79.18	63.18	49.98	11.20	4.975	2.300
	R_2	79.90	63.05	49.90	11.68	4.900	2.350
Control (without secretion)	R_1	49.80	31.78	5.275	4.975	2.150	0.4325
	R_2	49.88	31.75	5.350	4.900	2.10	0.5675

APPENDIX III: TABLE 18. Suspended weights (mg/ml) of Rockware sediment with secretions of A. marina after enzymes treatment at six different time intervals (5, 10, 20, 40, 60 and 120 seconds) in the sedimentation cylinder. The suspended weights of two control sediments are also present. R = replicates.

Factors	R	Time (secs)					
		5	10	20	40	60	120
Control (with secretion)	R_1	97.78	83.30	59.88	33.25	15.88	2.950
	R_2	97.85	83.15	59.90	33.35	15.63	2.900
α -amylase	R_1	52.80	49.88	33.88	10.58	4.750	1.250
	R_2	52.85	49.83	33.75	10.55	4.650	1.100
Hyaluronidase	R_1	83.03	57.68	50.55	9.975	4.525	2.550
	R_2	82.98	57.60	50.50	9.850	4.550	2.600
Lipase	R_1	65.50	50.03	49.68	21.55	4.550	1.450
	R_2	65.55	50.05	49.58	21.45	4.500	1.500
Lysozyme	R_1	69.83	50.30	49.68	9.700	4.525	1.600
	R_2	69.75	50.30	49.75	9.800	4.550	1.650
Pepsin	R_1	60.00	50.13	49.38	4.875	2.950	1.300
	R_2	60.05	50.08	49.20	4.900	2.850	1.200
Trypsin	R_1	85.00	61.18	49.83	9.825	4.575	2.625
	R_2	85.05	61.05	49.75	9.500	4.500	2.725
Control (without secretion)	R_1	49.80	31.65	5.350	3.900	2.150	1.025
	R_2	49.83	31.85	5.325	3.875	2.175	1.025

APPENDIX III: TABLE 19. Means and standard deviations of suspended weights. Effects of Nereis diversicolor and Corophium volutator secretions and control (no secretion) on the suspended weight of Rockware sediment at 5, 10 and 20 cm depth for successive time intervals, in the sedimentation cylinder.

	Depth (cm)	Time (secs)					
		5	10	20	40	60	120
Nereis diversicolor	5	55.04 ± 0.05657	50.08 ± 0.1414	42.33 ± 1.131	29.53 ± 3.111	10.36 ± 0.2475	1.925 ± 0.7070
	10	90.76 ± 2.015	77.54 ± 3.550	62.46 ± 0.9546	50.11 ± 0.0354	38.68 ± 0.07070	12.54 ± 3.521
	20	68.36 ± 3.995	55.01 ± 0.03536	50.11 ± 0.1061	43.26 ± 0.3889	14.73 ± 1.980	4.325 ± 0.9192
Corophium volutator	5	46.06 ± 3.642	24.88 ± 1.838	15.48 ± 0.1414	6.625 ± 0.1414	4.925 ± 0.07071	1.975 ± 0.1414
	10	62.28 ± 0.6010	50.18 ± 0.2828	46.63 ± 3.182	36.33 ± 0.3182	21.57 ± 0.02121	7.525 ± 0.03536
	20	55.01 ± 0.03536	43.59 ± 1.004	37.08 ± 2.970	18.33 ± 3.111	5.188 ± 0.1945	4.075 ± 1.273
Control	5	22.53 ± 1.202	18.31 ± 0.6718	4.538 ± 0.05303	1.275 ± 0.2828	0.8250 ± 0.1414	0.5750 ± 0.07071
	10	49.92 ± 0.09192	31.86 ± 0.1061	5.263 ± 0.1237	3.300 ± 0.07071	2.113 ± 0.01768	0.8750 ± 0.1768
	20	55.53 ± 0.7778	40.83 ± 0.4243	19.21 ± 2.722	6.350 ± 0.4596	4.038 ± 0.05303	1.450 ± 0.1768

APPENDIX III: TABLE 20. Two-way analyses of variance of the suspended weights (mg/ml) obtained for three treatments (sediment containing N. diversicolor secretion, sediment containing C. volutator secretions and the control sediment (sediment with no secretions)) at 5, 10 and 20 cm depths, and at six time intervals.

Factor A = the three different depths.
Factor B = six time intervals.

Treatment	Factors	Sum of square	Mean square	D.F	F-ratio	Probability
Sediment with Nereis diversicolor	Factor A	3515.8	1757.9	2	511.0	
	Factor B	18118.8	3623.8	5	1053.4	
	Interaction	573.4	57.34	10	16.67	$P < 0.001$ *****
	Error	61.92	3.440	18		
	Total	22270.0		35		
Sediment with Corophium volutator	Factor A	2586.1	1293.1	2	479.5	
	Factor B	10596.5	2119.3	5	785.8	
	Interaction	675.8	67.58	10	25.06	$P < 0.001$ *****
	Error	48.54	2.697	18		
	Total	13906.9		35		
Control	Factor A	1056.5	528.2	2	904.1	
	Factor B	9090.0	1818.0	5	3111.5	
	Interaction	1015.6	101.6	10	173.8	$P < 0.001$ *****
	Error	10.52	0.5843	18		
	Total	11172.5		35		

APPENDIX III: TABLE 21. One-way anovars comparing the suspended weights (mg/ml) of Rockware sediment containing Nereis diversicolor secretions at the three different depths (5, 10 and 20 cm) and for the six time intervals.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	1303.1	651.5	2	97.61	$0.005 > P > 0.001$
	Error	20.03	6.675	3		
	Total	1323.1		5		****
10	Main	857.4	428.7	2	101.9	$0.005 > P > 0.001$
	Error	12.62	4.207	3		
	Total	870.0		5		****
20	Main	412.0	206.0	2	280.6	$P < 0.001$
	Error	2.203	0.7342	3		
	Total	414.2		5		*****
40	Main	462.8	231.4	2	70.60	$0.005 > P > 0.001$
	Error	9.833	3.278	3		
	Total	472.6		5		****
60	Main	930.0	465.0	2	350.0	$P < 0.001$
	Error	3.986	1.329	3		
	Total	934.0		5		*****
120	Main	123.9	61.97	2	14.03	$0.05 > P > 0.025$
	Error	13.25	4.417	3		
	Total	137.2		5		*

APPENDIX III: TABLE 22. One-way anovars comparing the suspended weights (mg/ml) of Rockware sediment containing Corophium volutator secretions at the three different depths (5, 10 and 20 cm) and for the six time intervals.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	264.0	132.0	2	29.07	$0.025 > P > 0.01$
	Error	13.62	4.541	3		
	Total	277.7		5		**
10	Main	689.1	344.5	2	231.3	$P < 0.001$
	Error	4.468	1.489	3		
	Total	693.5		5		*****
20	Main	1018.7	509.4	2	80.57	$0.005 > P > 0.001$
	Error	18.97	6.322	3		
	Total	1037.7		5		****
40	Main	895.3	447.6	2	137.0	$0.005 > P > 0.001$
	Error	9.801	3.267	3		
	Total	905.1		5		****
60	Main	363.5	181.7	2	12601.7	$P < 0.001$
	Error	0.04326	0.01442	3		
	Total	363.5		5		*****
120	Main	31.41	15.71	2	28.71	$0.025 > P > 0.01$
	Error	1.641	0.5471	3		
	Total	33.05		5		**

APPENDIX III: TABLE 23. One-way anovars comparing the suspended weights (mg/ml) of the control Rockware sediment at the three different depths (5, 10 and 20 cm) and for the six time intervals.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	1247.0	623.5	2	908.7	$P < 0.001$
	Error	2.058	0.6862	3		
	Total	1249.0		5		*****
10	Main	514.4	257.2	2	1200.8	$P < 0.001$
	Error	0.6425	0.2142	3		
	Total	515.0		5		*****
20	Main	273.4	136.7	2	55.19	$0.005 > P > 0.001$
	Error	7.429	2.476	3		
	Total	280.8		5		****
40	Main	26.11	13.05	2	132.2	$0.005 > P > 0.001$
	Error	0.2963	0.09875	3		
	Total	26.40		5		****
60	Main	10.46	5.228	2	678.2	$P < 0.001$
	Error	0.02313	0.007708	3		
	Total	10.48		5		*****
120	Main	0.7908	0.3954	2	17.57	$0.025 > P > 0.01$
	Error	0.06750	0.02250	3		
	Total	0.8583		5		**

APPENDIX III: TABLE 24. Two-way analyses of variance comparing the suspended weights (mg/ml) of the three treatments (sediment with C. volutator secretions, sediment with N. diversicolor secretions and the control sediment) at the depth of 5 cm.

Factor A = three different treatments.

Factor B = six time intervals.

Factor	Sum of squares	Mean square	D.F	F-ratio	Probability
Factor A	3401.3	1700.7	2	1028.6	
Factor B	7062.1	1412.4	5	854.3	
Interaction	1359.0	135.9	10	82.20	$P < 0.001$ *****
Error	29.76	1.653	18		
Total	11852.1		35		

APPENDIX III: TABLE 25. Two-way analyses of variance comparing the suspended weights (mg/ml) obtained from the three treatments (sediment with C. volutator secretions, sediment with N. diversicolor secretions and the control sediment) at the depth of 10 cm.

Factor A: the three different treatments.

Factor B: six time intervals

Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
Factor A	9531.6	4765.8	2	2106.7	
Factor B	14473.8	2894.8	5	1279.6	
Interaction	1615.8	161.6	10	71.43	$P < 0.001$ *****
Error	40.72	2.262	18		
Total	25662.0		35		

APPENDIX III: TABLE 26. Two-way analyses of variance comparing the suspended weights (mg/ml) obtained from the three treatments (sediment with C. volutator secretions, sediment with N. diversicolor secretions and the control sediment) at the depth of 20 cm.

Factor A: the three different treatments.

Factor B: six time intervals.

Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
Factor A	2113.3	1056.7	2	376.6	
Factor B	14519.5	2903.9	5	1035.1	
Interaction	1039.9	104.0	10	37.07	$P < 0.001$ ******
Error	50.50	2.805	18		
Total	17723.2		35		

APPENDIX III: TABLE 27. One-way analyses of variance comparing the suspended weights (mg/ml) of Rockware sediment for the three treatments (sediment with C. volutator secretions, sediment with N. diversicolor secretions, and the control sediment) at 5 cm depth for the six time intervals (main factors the three treatments).

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	1127.4	563.7	2	115.0	$0.005 > P > 0.001$
	Error	14.71	4.903	3		
	Total	1142.1		5		****
10	Main	1125.3	562.6	2	438.3	$P < 0.001$
	Error	3.851	1.284	3		
	Total	1129.1		5		*****
20	Main	1512.6	756.3	2	1741.6	$P < 0.001$
	Error	1.303	0.4343	3		
	Total	1513.9		5		*****
40	Main	901.1	450.5	2	138.2	$0.005 > P > 0.001$
	Error	9.780	3.260	3		
	Total	910.9		5		****
60	Main	91.41	45.71	2	1589.7	$P < 0.001$
	Error	0.08625	0.02875	3		
	Total	91.50		5		*****
120	Main	2.523	1.262	2	126.2	$0.005 > P > 0.001$
	Error	0.03000	0.01000	3		
	Total	2.553		5		****

APPENDIX III: TABLE 28. One-way analyses of variance comparing the suspended weights (mg/ml) of Rockware sediment for the three treatments (sediment with C. volutator secretions, sediment with N. diversicolor secretions, and the control sediment) at 10 cm depth for the six time intervals (main factor the three treatments).

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	1754.5	877.3	2	594.0	$P < 0.001$
	Error	4.431	1.477	3		
	Total	1759.0		5		******
10	Main	2114.3	1057.2	2	249.9	$P < 0.001$
	Error	12.69	4.230	3		
	Total	2127.0		5		******
20	Main	3488.5	1744.2	2	473.5	$P < 0.001$
	Error	11.05	3.684	3		
	Total	3499.5		5		******
40	Main	2314.2	1157.1	2	32290.7	$P < 0.001$
	Error	0.1075	0.03583	3		
	Total	2314.3		5		******
60	Main	1339.0	669.5	2	348547.5	$P < 0.001$
	Error	0.005763	0.001921	3		
	Total	1339.0		5		******
120	Main	137.0	68.48	2	16.52	$0.025 > P > 0.01$
	Error	12.43	4.144	3		
	Total	149.4		5		**

APPENDIX III: TABLE 29. One-way analyses of variance comparing the suspended weights (mg/ml) of Rockware sediment for the three treatments (sediment with C. volutator secretions, sediment with N. diversicolor secretions, and the control sediment) at 20 cm depth for the six time intervals.

Time (secs)	Factors	Sum of squares	Mean squares	D.F	F-ratio	Probability
5	Main	228.7	114.3	2	20.70	$0.025 > P > 0.01$
	Error	16.57	5.523	3		
	Total	245.2		5		**
10	Main	225.9	113.0	2	284.9	$P < 0.001$
	Error	1.189	0.3965	3		
	Total	227.1		5		*****
20	Main	962.7	481.3	2	88.90	$0.005 > P > 0.001$
	Error	16.24	5.414	3		
	Total	978.9		5		****
40	Main	1588.1	794.0	2	237.2	$P < 0.001$
	Error	10.04	3.348	3		
	Total	1598.1		5		*****
60	Main	137.8	68.90	2	52.19	$0.005 > P > 0.001$
	Error	3.961	1.320	3		
	Total	141.8		5		****
120	Main	10.15	5.073	2	6.097	$0.10 > P > 0.05$
	Error	2.496	0.8321	3		
	Total	12.64		5		

APPENDIX III: TABLE 30. Means and standard deviations of particle sizes obtained from Rockware sediment during sedimentation at 5, 10 and 20 cm depths at six time intervals. Treatments were Rockware sediment with C. volutator secretions, Rockware sediment with N. diversicolor secretions, and a control sediment. (Mean and S.D's were calculated from the longest and shortest diameter of 100 sand grains for each treatment.)

Treatment	Depth (cm)	Time (secs)					
		5	10	20	40	60	120
Nereis diversicolor	5	174.8 ± 27.25	152.6 ± 35.48	144.2 ± 30.80	143.6 ± 25.32	122.9 ± 27.78	117.4 ± 18.82
	10	294.8 ± 27.62	278.0 ± 30.57	276.1 ± 30.05	257.1 ± 36.27	164.3 ± 35.64	152.2 ± 33.55
	20	182.6 ± 26.36	182.3 ± 45.3	163.6 ± 46.66	145.8 ± 46.43	118.5 ± 27.75	111.3 ± 16.07
Corophium volutator	5	130.0 ± 17.55	102.1 ± 13.05	89.78 ± 14.68	83.19 ± 13.15	73.19 ± 10.72	61.34 ± 11.96
	10	160.8 ± 25.16	133.2 ± 24.46	132.0 ± 17.08	107.4 ± 13.56	93.46 ± 14.98	84.29 ± 11.73
	20	134.4 ± 26.52	126.7 ± 27.63	119.2 ± 23.77	95.04 ± 12.90	76.55 ± 11.20	64.70 ± 11.23
Control	5	83.66 ± 12.11	78.64 ± 11.41	77.46 ± 12.68	75.41 ± 9.020	61.15 ± 15.32	49.49 ± 9.987
	10	99.46 ± 11.39	87.57 ± 14.16	82.99 ± 12.17	78.41 ± 10.49	68.85 ± 13.45	62.09 ± 10.46
	20	129.4 ± 17.21	113.5 ± 13.97	104.2 ± 16.03	93.46 ± 16.83	79.32 ± 14.31	57.99 ± 11.88

APPENDIX III: TABLE 31. Nereis diversicolor secretions. Comparison of sizes of particles between 5, 10 and 20 cm for successive time intervals, in the sedimentation cylinder.

Time (secs)	Comparison	D.F	t-test	Probability
5	5 cm x 10 cm	198	30.90	$P < 0.001$ *****
	5 cm x 20 cm	200	2.057	$0.05 > P > 0.02$ *
	10 cm x 20 cm	200	29.39	$P < 0.001$ *****
10	5 cm x 10 cm	196	26.78	$P < 0.001$ *****
	5 cm x 20 cm	189	5.161	$P < 0.001$ *****
	10 cm x 20 cm	175	17.51	$P < 0.001$ *****
20	5 cm x 10 cm	198	30.65	$P < 0.001$ *****
	5 cm x 20 cm	173	3.470	$P < 0.001$ *****
	10 cm x 20 cm	170	20.27	$P < 0.001$ *****
40	5 cm x 10 cm	179	25.66	$P < 0.001$ *****
	5 cm x 20 cm	154	0.4160	$0.7 > P > 0.06$
	10 cm x 20 cm	189	18.89	$P < 0.001$ *****
60	5 cm x 10 cm	198	9.458	$P < 0.001$ *****
	5 cm x 20 cm	198	1.121	$0.3 > P > 0.2$
	10 cm x 20 cm	198	10.14	$P < 0.001$ *****
120	5 cm x 10 cm	157	9.046	$P < 0.001$ *****
	5 cm x 20 cm	198	2.465	$0.01 > P > 0.001$ ***
	10 cm x 20 cm	143	10.99	$P < 0.001$ *****

APPENDIX III: TABLE 32. Corophium volutator secretions. Comparison of sizes of particles between 5, 10 and 20 cm for successive time intervals, in the sedimentation cylinder.

Time (secs)	Comparison	D.F	t-test	Probability
5	5 cm x 10 cm	178	10.04	$P < 0.001$ *****
	5 cm x 20 cm	173	1.384	$0.2 > P > 0.1$
	10 cm x 20 cm	198	7.222	$P < 0.001$ *****
10	5 cm x 10 cm	152	11.22	$P < 0.001$ *****
	5 cm x 20 cm	142	8.051	$P < 0.001$ *****
	10 cm x 20 cm	198	1.761	$0.1 > P > 0.05$
20	5 cm x 10 cm	198	18.75	$P < 0.001$ *****
	5 cm x 20 cm	166	10.53	$P < 0.001$ *****
	10 cm x 20 cm	181	4.373	$P < 0.001$ *****
40	5 cm x 10 cm	198	12.82	$P < 0.001$ *****
	5 cm x 20 cm	198	6.433	$P < 0.001$ *****
	10 cm x 20 cm	198	6.604	$P < 0.001$ *****
60	5 cm x 10 cm	181	11.00	$P < 0.001$ *****
	5 cm x 20 cm	200	2.167	$0.05 > P > 0.02$ *
	10 cm x 20 cm	185	9.041	$P < 0.001$ *****
120	5 cm x 10 cm	198	13.70	$P < 0.001$ *****
	5 cm x 20 cm	198	2.048	$0.05 > P > 0.02$ *
	10 cm x 20 cm	198	12.06	$P < 0.001$ *****

APPENDIX III: TABLE 33. Control sediment (no secretion). Comparison of sizes of particles between 5, 10 and 20 cm for successive time intervals, in the sedimentation cylinder.

Time (secs)	Comparison	D.F	t-tests	Probability
5	5 cm x 10 cm	198	9.504	$P < 0.001$ *****
	5 cm x 20 cm	198	21.74	$P < 0.001$ *****
	10 cm x 20 cm	173	14.51	$P < 0.001$ *****
10	5 cm x 10 cm	191	4.911	$P < 0.001$ *****
	5 cm x 20 cm	198	19.33	$P < 0.001$ *****
	10 cm x 20 cm	198	13.04	$P < 0.001$ *****
20	5 cm x 10 cm	198	3.146	$0.01 > P > 0.001$ ****
	5 cm x 20 cm	190	13.08	$P < 0.001$ *****
	10 cm x 20 cm	99	2.076	$0.05 > P > 0.02$ *
40	5 cm x 10 cm	198	2.168	$0.05 > P > 0.02$ *
	5 cm x 20 cm	153	9.453	$P < 0.001$ *****
	10 cm x 20 cm	167	7.589	$P < 0.001$ *****
60	5 cm x 10 cm	198	3.777	$P < 0.001$ *****
	5 cm x 20 cm	198	8.667	$P < 0.001$ *****
	10 cm x 20 cm	198	5.331	$P < 0.001$ *****
120	5 cm x 10 cm	198	8.712	$P < 0.001$ *****
	5 cm x 20 cm	198	5.477	$P < 0.001$ *****
	10 cm x 20 cm	198	2.590	$0.02 > P > 0.01$ **

APPENDIX III: TABLE 34. Effects of secretions of Nereis diversicolor (N.d.) and Corophium volutator (C.v.) on sedimentation; 5 cm depth. Comparison of sizes of particles between N.d., C.v., and controls (no secretion), for successive time intervals, in the sedimentation cylinder

Time (secs)	Comparison	D.F	t-test	Probability
5	N.d. x C.v.	170	13.82	P < 0.001 *****
	N.d. x control	137	30.56	P < 0.001 *****
	C.v. x control	177	21.73	P < 0.001 *****
10	N.d. x C.v.	126	13.36	P < 0.001 *****
	N.d. x control	120	19.84	P < 0.001 *****
	C.v. x control	196	13.53	P < 0.001 *****
20	N.d. x C.v.	143	15.95	P < 0.001 *****
	N.d. x control	132	20.04	P < 0.001 *****
	C.v. x control	193	3.561	P < 0.001 *****
40	N.d. x C.v.	150	21.17	P < 0.001 *****
	N.d. x control	124	25.37	P < 0.001 *****
	C.v. x control	177	4.879	P < 0.001 *****
60	N.d. x C.v.	128	16.69	P < 0.001 *****
	N.d. x control	155	19.46	P < 0.001 *****
	C.v. x control	179	6.439	P < 0.001 *****
120	N.d. x C.v.	169	25.14	P < 0.001 *****
	N.d. x control	152	31.87	P < 0.001 *****
	C.v. x control	194	7.605	P < 0.001 *****

APPENDIX III: TABLE 35. Effects of secretions of Nereis diversicolor (N.d.) and Corophium volutator (C.v.) on sedimentation. 10 cm depth. Comparison of sizes of particles between N.d.; C.v. and controls (no secretion), for successive time intervals, in the sedimentation cylinder.

Time (secs)	Comparison	D.F	t-test	Probability	
5	N.d. x C.v.	198	35.87	P < 0.001	*****
	N.d. x control	132	65.38	P < 0.001	*****
	C.v. x control	139	22.21	P < 0.001	*****
10	N.d. x C.v.	191	36.98	P < 0.001	*****
	N.d. x control	140	56.52	P < 0.001	*****
	C.v. x control	160	16.14	P < 0.001	*****
20	N.d. x C.v.	158	41.69	P < 0.001	*****
	N.d. x control	131	59.56	P < 0.001	*****
	C.v. x control	181	23.37	P < 0.001	*****
40	N.d. x C.v.	127	38.66	P < 0.001	*****
	N.d. x control	116	47.33	P < 0.001	*****
	C.v. x control	188	16.91	P < 0.001	*****
60	N.d. x C.v.	134	18.32	P < 0.001	*****
	N.d. x control	127	25.06	P < 0.001	*****
	C.v. x control	198	12.22	P < 0.001	*****
120	N.d. x C.v.	123	19.11	P < 0.001	*****
	N.d. x control	118	25.64	P < 0.001	*****
	C.v. x control	197	14.13	P < 0.001	*****

APPENDIX III: TABLE 36. Effects of secretions of Nereis diversicolor (N.d.) and Corophium volutator (C.v.) on sedimentation. 20 cm depth. Comparison of sizes of particles between N.d.; C.v.; and controls (no secretion), for successive time intervals, in the sedimentation cylinder.

Time (secs)	Comparison	D.F	t-test	Probability	
5	N.d. x C.v.	198	12.89	$P < 0.001$	*****
	N.d. x control	172	16.90	$P < 0.001$	*****
	C.v. x control	171	1.582	$0.2 > P > 0.1$	
10	N.d. x C.v.	165	10.48	$P < 0.001$	*****
	N.d. x control	118	14.51	$P < 0.001$	*****
	C.v. x control	147	4.263	$P < 0.001$	*****
20	N.d. x C.v.	148	8.479	$P < 0.001$	*****
	N.d. x control	123	12.04	$P < 0.001$	*****
	C.v. x control	175	5.231	$P < 0.001$	*****
40	N.d. x C.v.	115	10.53	$P < 0.001$	*****
	N.d. x control	125	10.60	$P < 0.001$	*****
	C.v. x control	187	0.7451	$0.5 > P > 0.4$	*****
60	N.d. x C.v.	131	14.02	$P < 0.001$	*****
	N.d. x control	149	12.55	$P < 0.001$	*****
	C.v. x control	189	1.524	$0.2 > P > 0.1$	
120	N.d. x C.v.	179	23.77	$P < 0.001$	*****
	N.d. x control	184	26.68	$P < 0.001$	*****
	C.v. x control	198	4.105	$P < 0.001$	*****

Scanning electron microscopy methodology

Samples were prepared for the scanning electron microscope as follows.

1. Dehydration

Fixed samples were dehydrated using a series of acetone solutions of increasing concentrations (30%, 50%, 70%, 90% and 100%). The samples were given two 5-minute washes at each concentration.

2. Critical point drying

Dehydrated samples were transferred to metal baskets, ensuring that the samples remained immersed in the anhydrous acetone solutions. The critical point drying apparatus was then set up. Baskets containing samples were transferred very rapidly from the acetone solution into the critical point drying apparatus to prevent the sample drying out. The apparatus was then rapidly sealed.

The inlet valve was opened to fill the chamber of the apparatus with liquid gas. The ventilation valve was opened to avoid back pressure building up while the inlet valve remained fully open the whole time. Samples were then reflushed with fresh liquid gas by opening the drain valve. At the same time, the ventilation valve was opened slightly to maintain the liquid level.

After reflushing the samples, the chamber was filled with liquid CO_2, while ventilation and drain valves were closed. Samples remained inside the critical point drying apparatus for one hour and were flushed every 15 minutes with CO_2.

Finally, the inlet valve was closed and the liquid level was allowed to fall to the top of the metal baskets.

Complete drying was accomplished by slowly heating the sample to 36-40°C with all valves closed. Pressure remained at 1400 PSi. After 5 minutes, the gaseous CO_2 was slowly vented from the chamber, while the temperature was maintained at 36°C. The ventilation valve was operated slowly since condensation of the gas back to liquid phase could occur due to the local cooling effect produced by expansion of the gas by rapid venting. Ventilation time was always in excess of 10 minutes. The baskets containing the samples were removed from the critical point drying apparatus after the pressure had fallen to zero.

3. Gold coating stubs

Stubs from each sample were prepared as follows.

Each stub was covered with a double-sided adhesive cellophane tape leaving a margin around the edge. The margins of the stubs were then painted with a quick drying silver paint and allowed to dry for 30 minutes before use.

A small sample of the critical-point-dried material was then transferred very gently to the stubs using a binocular microscope.

The stubs were gold coated as follows:

1. they were placed in the gold coating machine;

2. Argon gas was set to a pressure reading of 4 on the meter scale on the Argon cylinder;

3. the operation switch was set to pump, and the chamber was evacuated until the pirani guage read 0.07 TOR;

4. the leak valve was rotated one revolution in an anticlockwise direction (this step was repeated several times);

5. the H.T. position was selected on the operation switch and the control (H.T.) rotated until the pointer indicated 1.2 KV;

6. the operation switch was then set to timer. An interval of 2 minutes was selected;

7. the leak valve was rotated to read 40 m amps on the current meter;

8. at the end of the 2 minutes, the leak valve was turned to zero in a clockwise direction, the H.T. control switched to zero, the operation switch set to the off position, and the Argon gas supply at the cylinder switch off;

9. finally, air was admitted to the chamber by lifting the air admittance valve on the top plate, the stubs were then placed in the SEM for study or stored.

SEM Procedure

A. Sequence of operations involved in switching on the SEM

The SEM was switched on using the following procedure:

1. the main power box and the water cooling unit was switched on;

2. the mains switch and vacuum systems was switched on;

3. the meter selector was turned to the PVL position. This activated the automatic pumping system which evacuated the system over a period of 20 minutes allowing the diffusion pump to warm up. The HV light then went out;

4. the meter selector was turned on to HV, and the movement of the needle was observed from right to left, showing an increased vacuum up to 5×10^{-5} torr;

5. the instrument was then ready to use.

B. Specimen insertion and removal using the five-specimen carrier

Sample insertions and removals were carried out as follows:

1. X-position and Y-position controls were set at 7, the tilt lever was set at 33^{o} ( ), and the lever locked at this position;

2. magnification was turned fully anticlockwise, SED control switched off, and GAIN and BLACK levels were set to zero. The H.T. was switched off by depressing the button to extinguish its light. Thirty seconds were allowed for filament cooling and then air was admitted by pressing the vacuum system OFF and AIR buttons in close succession;

3. the positions of the X and Y controls and tilt were checked;

4. after the noise of air entering had ceased, the stage was pulled out using the two handles on the front of the stage;

5. the five-specimen carrier was removed using an Allen Key;

6. the stubs were inserted into the holder and clamped using an Allen Key. The stage was pushed back into the chamber ensuring a good seating of the sealing ring;

7. AIR and ON buttons of the vacuum system were closed in close succession to evacuate the microscope column to a working vacuum (i.e. H.V light extinguishes);

8. the stage was tilted to "0" and locked in this position using the handles on the front of the stage. An image of the samples on the SEM screen was obtained following the general operating procedure as below.

C. General operating procedure for SEM

1. The specimen position was switched to 3 and the detector to 2;

2. the SED control was set at off, and the GAIN and BLACK levels to zero;

3. a check was made to ensure that the 1X button of the scan generator was not depressed;

4. the KV button was selected to be on 6, and 250 lines were selected;

5. the H.T. button was switched on and the magnification was reduced;

6. the 1X range was selected on the SED control;

7. an image was obtained on the viewing monitor by increasing the GAIN and BLACK levels when the line time was switched on to I.T position;

8. the sample was then examined and certain areas were selected for photography.

D. Photography

1. After selecting an area of interest at an appropriate magnification and spot size, the vacuum system was checked to ensure that the automatic pumping system would not operate by observing the meter reading on position PVB of the selector. If the needle approached 40, the button (ON) of the vacuum system was pressed and no further action taken until the pump had ceased;

2. 250 lines was selected and the button of the scan mode was pressed;

3. line time was switched to 1 msec and the image was focussed at one step higher magnification than desired;

4. astigmatism was corrected by moving the two shift controls on the scan generator;

5. magnification was turned to the desired setting and the I.T was switched on to obtain a viewing monitor image;

6. a margin of half an inch all round the image on the viewing monitor was allowed as a rough guide to the area that would appear on the photographic negative;

7. the scan mode was switched back to full frame;

8. 32 msecs on the line time and 1000 lines on the scan generator was selected watching the signal profile on the videoscope. Ideally the band of signals should lie mid-way between black and white lines on the videoscope screen;

9. the "IX" image button and the "exp" button were then pressed one after another to expose the film;

10. at the end of the scan (1 min) the "exp" button went out automatically. The film was then advanced and the "IX" button released.

REFERENCES

REFERENCES

ALEXANDER, M. (1977). Introduction to Soil Microbiology. Wiley: New York.

ALLEN, J.R.L. (1977). The plan shape of current ripples in relation to flow conditions. Sedimentology 24: 53-62.

ALLEN, T. (1975). Particle Size Measurement. Chapman and Hall: London.

ALLER, R.C. (1978a). The effects of animal sediment interactions on geochemical processess near the sediment-water interface. pp. 157-172. In: Estuarine Interactions. Ed. M. Wiley. Academic Press: New York and London.

ALLER, R.C. (1978b). Experimental studies of changes produced by deposit feeders on pore water, sediment, and overlying water chemistry. Am. J. Sci. 278: 1185-1234.

ALLER, R.C. (1980). Diagenetic processes near the sediment-water interface of Lond Island South. I. Decomposition and nutrient element geochemistry (S.N.P.). Adv. Geophys. 22: 237-350.

ALLER, R.C. (1982). The effects of macrobenthos on chemical properties of marine sediment and overlying water. pp. 53-102. In: Animal-Sediment Relations. Eds. P.L. McCall and M.J.S. Tevesz. Plenum Press: New York.

ALLER, R.C. (1983). The importance of the diffusive permeability of animal burrow linings in determining marine sediment chemistry. J. mar. Res. 41: 299-322.

ALLER, R.C. and YINGST, J.Y. (1978). Biochemistry of tube dwellings: a study of the sedentary polychaete Amphitrite ornata (Leidy). J. mar. Res. 36: 201-254.

ALLER, R.C. and YINGST, J.Y. (1980). Relationships between microbial distribution and the anaerobic decomposition of organic matter in surface sediments of Long Island Sound, U.S.A. Mar. Biol. 56: 29-42.

ANDERSON, F.E., BLACK, L., WATLING, L.E., MOOK, W. and MAYER, L.M. (1981). A temporal and spatial study of mud flat erosion and deposition. J. sedim. Petrol. 51: 729-736.

ANDERSON, J.G., BOONRUANG, P. and MEADOWS, P.S. (1981). Interrelationships between chlorophylls, carbon, nitrogen and heterotropic bacteria in an intertidal sediment transect. Mar. Ecol. Prog. Ser. 6: 277-283.

ANDERSON, J.G. and MEADOWS, P.S. (1965). Micro-organisms and organic matter attached to the surface of marine sand grains. J. gen. Microbiol. 41: 3.

ANDERSON, J.G. and MEADOWS, P.S. (1969). Bacteria on intertidal sand grains. Hydrobiologia 33: 33-46.

ANDERSON, J.G. and MEADOWS, P.S. (1978). Microenvironments in marine sediments. Proc. R. Soc. Edinb. 76B: 1-16.

ANDERSON, J.G. and MORRIS, E.O. (1974). A review of studies on the microorganisms of the Clyde Sea area. pp. 28-31. In: The Clyde Estuary and Firth. The Natural Environment Research Council Publications, Series C, No. 11.

ANDERSON, N.R. and MALAHOFF, A. (1977). The Fate of Fossil Fuel CO_2 in the Oceans. Plenum Press: New York.

ANON. (1974). Introduction: general information about Clyde Sea area. pp. 3-5. In: The Clyde Estuary and Firth. The Natural Environment Research Council Publications, Series C, No. 11.

ARNOLD, H.D. (1911). Limitations imposed by slip and inertia term upon Stokes' Law for the motion of spheres through liquids. Phil. Mag. 22: 755-775.

ASPIRAS, R.B., ALLEN, O.N., HARRIS, R.F. and CHESTERS, G. (1971). The role of microorganisms in the stabilizations of soil aggregates. Soil Biol. Biochem. 3: 347-353.

BAFFONI, G.M. (1968). Osservazioni morfologiche sul tegumento in un polichete errante. Atti Accad. naz. Lincei Rc. 44: 463-468.

BAGANDER, L.E. and NIEMISTÖ, L. (1978). An evaluation of the use of redox measurements for characterising recent sediments. Estuar. Coast. Mar. Sci. 6: 127-134.

BAGNOLD, R.A. and BARNODORFF-NIELSEN, O. (1980). The pattern of natural size distribution. Sedimentology 27: 199-207.

BAILEY, N.T.J. (1959). Statistical Methods in Biology. Hodder and Stoughton: London and Sydney.

BARKER, S.A., HAYES, M.H.B., SIMMONDS, R.G. and STACEY, M. (1967). Studies on soil polysaccharides. Carbohyd. Res. 5: 13-24.

BARNES, R.D. (1980). Invertebrate Zoology. Saunders College: Holt, Rinehart and Winston: Philadelphia.

BARNES, R.S.K. (1974). Estuarine Biology. Edward Arnold: London.

BARRET, P.J. (1980). The shape of rock particles: a critical review. Sedimentology 27: 291-303.

BASS-BECKING, L.G.M., KAPLAN, I.R. and MOORE, D. (1960). Limits of the natural environment in terms of pH and oxidation-reduction potentials. J. Geol. 68: 243-284.

BATE, C.S. and WESTWOOD, J.O. (1862). A History of the British Sessile-Eyed Crustacea (Vol. I). John Van Voorst: London.

BATHURST, R.G.C. (1967). Subtidal gelatinous mat, sand stabilizer and food, Great Bahama Bank. J. Geol. 75: 736-738.

BERNER, R.A. (1980). Early Diagenesis: A Theoretical Approach. Princeton University Press: Princeton, New Jersey.

BIERNBAUM, C.K. (1979). Influence of sedimentary factors on the distribution of benthic amphipods of Fishers Island Sound, Connecticut. J. Exp. Mar. Biol. Ecol. 38: 201-225.

BLACK, M. (1933). The algal sediments of Andros Island, Bahamas. Phil. Trans. R. Soc. Lond. 22(B): 165-192.

BLOOM, S.A., SIMON, J.L. and HUNTER, V.D. (1972). Animal-sediment relations and community analysis of a Florida estuary. Mar. Biol. 13: 43-56.

BOCK, W.D. and MOORE, D.F. (1968). A commensal relationship between a foraminifer and a bivalve mollusc. Gulf. Res. Rep. 2: 273-279.

BOERSMA, J.R. and TERWINDT, J.H.J. (1981). Neap-spring tide sequences of intertidal shoal deposits in a mesotidal estuary. Sedimentology 28: 151-170.

BÖHM, L., DAWSON, R., LIEBEZEIT, G. and WEFER, G. (1980). Suitability of monosaccharides as markers for particle identification in carbonate sediments. Sedimentology 27: 167-177.

BOKUNIEURICZ, H.J., GORDON, R.B. and RHOADS, D.C. (1975). Mechanical properties of the sediment water interface. Mar. Geol. 18: 263-278.

BOWLES, J.E. (1978). Engineering Properties of Soil and their Measurement. McGraw-Hill: New York and London.

BRAYSHAW, A.C., FROSTICK, L.E. and REID, I. (1983). The hydrodynamics of particle clusters and sediment entrainment in coarse alluvial channels. Sedimentology 30: 137-143.

BRIDGES, P.H. and LEEDER, M.R. (1976). Sedimentary model for intertidal mud flat channels with examples from the Solway Firth, Scotland. Sedimentology 23: 533-552.

BRIGGS, D. (1977). Sediments. (Sources and Methods in Geography). Butterworths: London and Boston.

BRITISH STANDARDSA (1975). Methods of Test for Soils for Civil Engineering Purposes. British Standards Institution, GR 10: London. No. 1377.

BROWN, B. (1982). Spatial and temporal distribution of a deposit-feeding polychaete on a heterogenous tidal flat. J. Exp. Mar. Biol. Ecol. 65: 213-227.

BROWNING, G.M. and MILAM, F.M. (1944). Effect of different types of organic materials and lime on soil aggregation. Soil Sci. 57: 91-106.

BUCHANAN, J.B. and KAIN, J.M. (1971). Measurement of the physical and chemical environment. pp. 30-58. In: Methods for the Study of Marine Benthos. I.B.P. Handbooks, No. 16. Eds. N.A. Holme and A.D. McIntyre. Blackwell Scientific Publications: Oxford and Edinburgh.

BURGER, H. (1976). Log-normal interpolation in grain size analysis. Sedimentology 23: 395-405.

BURGES, A. (1958). Micro-organisims in the Soil. Hutchinson University Library: London.

BYRES, S.C., MILLS, E.L. and STEWART, P.L. (1978). A comparison of methods of determining organic carbon in marine sediments with suggestions for a standard method. Hydrobiologia 58: 43-47.

CADEE, G. (1976). Sediment reworking by Arenicola marina in tidal flats in the Dutch Wadden Sea. Neth. Jl. Sea Res. 10: 440-460.

CAMPBELL, A.C. and NICHOLLS, J. (1976). The Hamlyn Guide to the Seashore and Shallow Seas of Britain and Europe. Hamlyn: London and New York.

CAMPBELL, J.I. and MEADOWS, P.S. (1974). Gregarious behaviour in a benthic marine amphipod (Corophium volutator). Experientia 30: 1396-1397.

CAMPBELL, R. (1977). Microbial Ecology. John Wiley and Sons: New York and Chichester.

CAPPER, P.L. and CASSIE, W.F. (1976). The Mechanics of Engineering Soils. Sixth (SI) Edition. E and F.N. Spon: London.

CARLING, P.A. (1982). Temporal and spatial variation in intertidal sedimentation rate. Sedimentology 29: 17-23.

CHAMBERS' ENCYCLOPEDIA (1950). Camouflage - Confession of Faith. George Newnes: London.

CHAMBERS, M.R. and MILNE, H. (1975). Life cycle and production of Nereis diversicolor (O.F. Müller) in the Ythan Estuary, Scotland. Estuar. Coast. Mar. Sci. 3: 133-144.

CHANDLER, G.T. and FLEEGER, J.W. (1984). Tube-building by a marine meiobenthic harpacticoid copepod. Mar. Biol. 82: 15-19.

CHANNON, R.D. and HAMILTON, D. (1976). Wave and tidal current sorting of shell sediments southwest of England. Sedimentology 23: 17-42.

CHRISTAIN, R.R. and WETZEL, R.L. (1978). Interaction between substrate, microbes, and consumers of spartina detritus in estuaries. pp. 93-113. In: Estuarine Interactions. Ed. M.L. Wiley. Academic Press: New York and London.

COLLAR, R.H.F. (1974). The River Clyde Estuary current knowledge of water and sediment movement. pp. 10-13. In: The Clyde Estuary and Firth: An Assessment of Present Knowledge Compiled by Members of the Clyde Study Group. The Natural Environment Research Council Publication, Series C, No. 11.

COLLINS, M.B. and RIGLER, J.K. (1982). The use of settling velocity in defining the initiation of motion of heavy mineral grains, under unidirectional flow. Sedimentology 29: 419-426.

COLLINSON, J.D. and THOMPSON, D.B. (1982). Sedimentary Structures. Allen and Unwin: London.

COLWELL, R.R. and KAPER, J. (1978). Distribution, survival, and significance of pathogenic bacteria and viruses in estuaries. pp. 443-457. In: Estuarine Interactions. Ed. M.L. Wiley. Academic

Press: New York and London.

COULSON, J.M. and RICHARDSON, J.F. (1955). Chemical Engineering (Vol 2). Pergamon Press: Oxford and London.

CRAWFORD, G.I. (1937). A review of the amphipod genus Corophium, with notes on the British species. J. mar. biol. Ass. U.K. 21: 589-630.

CROKER, R.A. (1967). Niche diversity in five sympatric species of intertidal amphipods (Crustacea: Haustoriidae). Ecol. Monogr. 37: 173-200.

CRONIN, L.E. (Edit.) (1975). Estuarine Research (Vol. I): Chemistry, Biology, and the Estuarine System. Academic Press: New York and London.

CRONIN, L.E. (Edit.) (1975). Estuarine Research (Vol. II): Geology and Engineering. Academic Press: New York and London.

CROSS, F.A. and SUNDA, W.G. (1978). Relationship between bioavailability of trace metals and geotechnical processes in estuaries. pp. 429-442. In: Estuarine Interactions. Ed. M.L. Wiley. Academic Press: New York and London.

CRUICKSHANK, R., DUGUID, J.P., MARMION, B.P. and SWAIN, R.H.A. (1975). Medical Microbiology. Churchill Livingstone: London and New York.

CULLEN, D.J. (1973). Bioturbation of superficial marine sediments by interstitial meiobenthos. Nature, Lond. 242: 323-324.

CUMMINS, K.W. and LAUFF, G.H. (1969). The influence of substrate particle on the microdistribution of stream macrobenthos. Hydrobiologia 34: 145-181.

DALE, N.G. (1974). Bacteria in intertidal sediments: factors related to their distribution. Limnol. Oceanogr. 19: 509-518.

DALES, R.P. (1950). The reproduction and larval development of Nereis diversicolor (O.F. Müller). J. mar. biol. Ass. U.K. 29: 321-360.

DALES, R.P. (1951). An annual history of a population of Nereis diversicolor (O.F. Müller). Biol. Bull. mar. biol. Lab., Woods Hole 101: 131-137.

DALY, I.M. (1973). Behavioural and secretory activity during tube construction by Platynereis dumerilli. AUD. & M. EDW. (Polychaeta: Nereidae). J. mar. biol. Ass. U.K. 53: 521-529.

DAVIS, R.A. Jr (1983). Depositional Systems: A Genetic Approach to Sedimentary Geology. Prentice-Hall: New Jersey.

DAY, J.H. (1978). The effect of plants and animals on estuarine chemistry. pp. 216-221. In: Biogeochemistry of Estuarine Sediments. Proceedings of a UNESCO/SCOR Workshop, 1976. UNESCO: Paris.

DEAN, W.E. Jr (1974). Determination of carbonate and organic matter in calcareous sediments and sedimentary rocks by loss on ignition: comparison with other methods. J. sedim. Petrol. 44: 242-248.

DEANS, E.A., MEADOWS, P.S. and ANDERSON, J.G. (1982). Physical, chemical and maicrobiological properties of intertidal sediments, and sediment selection by Corophium volutator. Int. Revue ges. Hydrobiol. 67: 261-269.

DEEGAN, C.E. (1974). Geological investigations in the Firth of Clyde made by the Institute of Geological Sciences. pp. 6-9. In: The Clyde Estuary and Firth: An Assessment of Present Knowledge

Compiled by Members of the Clyde Study Group. The Natural Environment Research Council Publication, Series C, No. 11.

DEFLAUN, M.F. and MAYER, L.M. (1983). Relationships between bacteria and sediment grain surfaces in intertidal sediment. Limnol. Oceanogr. 28: 873-881.

DEFRETIN, R. (1971). The tubes of polychaete annelids. pp. 713-747. In: Comprehensive Biochemistry (Vol. 26, Part C). Eds M. Florkin and E.H. Stotz. Elsevier Publishing Company: Amsterdam and London.

DENNELL, R. (1960). Integumental and exoskeleton. In: The Physiology of Crustacea (Vol. I). Ed. T.H. Waterman. Academic Press: New York and London.

DIFCO MANUAL (1972). DIFCO Supplementary Literature. DIFCO Laboratories: Detroit and Michigan.

DILLON, W.P. and ZIMMERMAN, H.B. (1970). Erosion by biological activity in two New England submarine canyons. J. sedim. Petrol. 40: 542-547.

DONAHUE, J. (1971). Burrow morphologies in north-central Pacific sediments. Mar. Geol. 11: M1-M7.

DOUGLAS, J.F., GASIOREK, J.M. and SWAFFIELD, J.A. (1979). Fluid Mechanics. Pitman: London.

DORSETT, D.A. and HYDE, R. (1970). The spiral glands of Nereis. Z. Zellforsch. mikrosk. Anat. 110: 204-218.

DUANE, D.B. (1964). Significance of skewness in recent sediments, Western Pamlico Sound, North Carolina. J. sedim. Petrol. 34: 864-874.

DYER, K.R. (1979). Estuarine Hydrography and Sedimentation. Cambridge University Press: London and New York.

ECKMAN, J.E., NOWELL, A.R.M. and JUMARS, P.A. (1981). Sediment destabilization by animal tubes. J. mar. Res. 39: 361-374.

EDWARDS, J.M. and FREY, R.W. (1977). Substrate characteristics within a Holocence Salt Marsh, Sapelo Island, Georgia. Senckenberg. marit. 9: 215-259.

EINSELE, G. (1977). Range, velocity, and material flux of compaction flow in growing sedimentary sequences. Sedimentology 24: 639-655.

ELLIS, D. (1925). An investigation into the cause of blackening of the sand in parts of the Clyde Estuary. Jl. R. Tech. Coll. Glasg. 1: 144-156.

ELLIS, D. (1926). Part I: Thioporphyra volutants (Ellis) - a new genus of sulphur bacteria. Part II: the sulphur bacteria as aids in the study of polluted water. Jl. R. tech. Coll. Glasg. 1: 165-177.

ELLIS, D. (1929). A bacteriological investigation into the state of pollution of the Clyde at Port Glasgow, Greenock and Gourock. Jl. R. Tech. Coll. Glasg. 2: 129-142.

ELLIS, D. (1932). The dilution of sewage in the sea. Jl. R. Tech. Coll. Glasg. 2: 698-707.

ELLIS, D. and STODDART, J.H. (1930). The chemical changes in pools containing vegetable remains infected with sulfur bacteria. Jl. R. Tech. Coll. Glasg. 2: 336-346.

ETTERSHANK, G., MAIN, B.Y., WILLIAMS, W.D., BLOWER, J.G. and GHENT, R.L. (1972). Phylum Arthropoda. pp. 392-613. In: Textbook of Zoology

Invertebrates. Eds A.J. Marshall and W.D. Williams. Macmillan: London and Basingstoke.

EWER, D.W. and HANSON, J. (1945). Some staining reactions of invertebrate mucoproteins. Jl. R. microsc. Soc. 65: 40-63.

FAGER, E.W. (1964). Marine sediments: effects of a tube-building polychaete. Science, N.Y. 143: 356-359.

FAUVEL, P. (1923). Polychetes Errantes. Tome 5 de Faune de France. Paul Lechevalier: Paris.

FEATHERSTONE, R.P. and RISK, M.J. (1977). Effects of tube-building polychaetes on intertidal sediments of the Minas Basin, Bay of Fundy. J. sedim. Petrol. 47: 446-450.

FENCHEL, T. (1969). The ecology of marine microbenthos. IV. Structure and function of the benthic ecosystem, its chemical and physical factors and the microfauna communities with special references to the ciliated protozoa. Ophelia 6: 1-182.

FENCHEL, T. (1970). Studies on the decomposition of organic detritus from the turtle grass, Thalassia testudinum. Limnol. Oceanogr. 15: 14-20.

FENCHEL, T. (1972). Aspects of decomposer food chains in marine benthos. Verh. dt. zool. Ges. 65: 14-22.

FENCHEL, T., KOFOED, L.H. and LAPPALAINEN, A. (1975). Particle size-selection of two deposit feeders: the amphipod Corophium volutator and the prosobranch Hydrobia ulvae. Mar. Biol. 30: 119-128.

FENCHEL, T.M. and RIEDL, R.J. (1970). The sulfide system: a new biotic community underneath the oxidised layer of marine sand bottoms. Mar. Biol. 7: 255-268.

FISH, J.D. and MILLS, A. (1979). The reproductive biology of Corophium volutator and Corophium arenarium (Crustacea: Amphipoda). J. mar. biol. Ass. U.K. 59: 355-368.

FLOOD, R.D. (1981). Distribution, morphology, and origin of sedimentary furrows in cohesive sediments, Southampton Water. Sedimentology 28: 511-529.

FOLK, R.L. (1966). A review of grain-size parameters. Sedimentology 6: 73-93.

FOLK, R.L. (1980). Petrology of Sedimentary Rocks. Hemphill Publishing Company: Austin, Texas.

FOLK, R.L. and WARD, W.C. (1957). Brazos River Bar: a study in the significance of grain size parameters. J. sedim. Petrol. 27: 3-26.

FOSTER-SMITH, R.L. (1978). An analysis of water flow in tube-living animals. J. Exp. Mar. Biol. Ecol. 34: 73-95.

FOX, J.A. (1974). An Introduction to Engineering Fluid Mechanics. Macmillan: London and Basingstoke.

FRANKEL, L. and MEAD, D.J. (1973). Mucilaginous matrix of some estuarine sands in Connecticut. J. sedim. Petrol. 43: 1090-1095.

FRIEDMAN, G.M. and SANDERS, J.E. (1978). Principles of Sedimentology. John Wiley and Sons: New York and Chichester.

FROSTICK, L.E. and McCAVE, I.N. (1979). Seasonal shifts of sediment within an estuary mediated by algal growth. Estuar. Coast. Mar. Sci. 9: 569-576.

FRUTON, J.S. and SIMMONDS, S. (1953). General Biochemistry. Chapman and Hall, Limited: London.

GALEHOUSE, J.S. (1971). Sedimentation analysis. pp. 69-94. In: Procedures in Sedimentary Petrology. Ed. R.C. Carver. Wiley Interscience: New York and London.

GASITH, A. (1976). Seston dynamics and tripton sedimentation in the pelagic zone of a shallow eutrohic lake. Hydrobiologia 51: 225-231.

GASPERI-MAGO, R.R. and TROEH, F.R. (1979). Microbial affects on soil erodibility. Soil Sci. Soc. Am. J. 43: 765-768.

GEOGHEGAN, M.J. and BRIAN, R.C. (1946). Influence of bacterial polysaccharides on aggregate formation in soils. Nature, Lond. 158: 837.

GEOGHEGAN, M.J. and BRIAN, R.C. (1948). Aggregate formation in soil. I. Influence of some bacterial polysaccharides on the binding of soil particles. Biochem. J. 43: 5-13.

GHOSH, J.K., MAZUMDER, B.S. and SENGUPTA, S. (1981). Methods of computation of suspended load from bed materials and flow parameters. Sedimentology 28: 781-791.

GIBBS, R.J., MATTHEWS, M.D. and LINK, D.A. (1971). The relationship between sphere size and settling velocity. J. sedim. Petrol. 4: 7-18.

GINSBURG, R.N. and LOWENSTAM, H.A. (1958). The influence of marine bottom communities on the depositional environment of sediments. J. Geol. 66: 310-318.

GORDON, D.C. (1966). The effects of the deposit feeding polychaete Pectinaria gouldii on the intertidal sediments of Barnstable Harbor. Limnol. Oceanogr. 11: 327-332.

GORVETT, H. (1946). The tegumental glands in the land Isopoda. A: the rosette glands. Q. Jl. microsc. Sci. 87: 209-235.

GORVETT, H. (1951). The tegumental glands in the land Isopoda. B: the lobed glands, structure and distribution. Q. Jl. microsc. Sci. 92: 275-296.

GORVETT, H. (1952). The tegumental glands in the land Isopoda. C: the lobed glands. The properties of their secretions and their mode of action. Q. Jl. microsc. Sci. 93: 17-29.

GORVETT, H. (1956). Tegumental glands and terrestrial life in wood lice. Proc. zool. Soc., Lond. 126: 291-314.

GRAETZ, D.A., KENNEY, D.R. and ASPIRAS, R.B. (1973). Eh status of lake sediment-water system in relation to nitrogen transformations. Limnol. Oceanogr. 18: 908-917.

GRANT, J. (1981). Sediment transport and disturbance on an intertidal sand flat: infaunal distribution and recolonisation. Mar. Ecol. Prog. Ser. 6: 249-255.

GRANT, W.D., BOYER, L.F. and SANFORD, L.P. (1982). The effect of bioturbation on the initiation of motion of intertidal sands. J. mar. Res. 40: 659-677.

GRAY, J.S. (1966). The attractive factor of intertidal sands to Protodrilus symbioticus. J. mar. biol. Ass. U.K. 46: 627-646.

GRAY, J.S. (1967). Substrate selection by the archiannelid Protodrilus hypoleucus Armenants. J. Exp. Mar. Biol. Ecol. 1: 47-54.

GRAY, J.S. (1974). Animal-sediment relationships. Oceanogr. Mar. Biol. Ann. Rev. 12: 223-261.

GRAY, J.S. and JOHNSON, R.M. (1970). The bacteria of a sandy beach as an ecological factor affecting the interstitial gastrotrich Turbanella hyalina Schultze. J. Exp. Mar. Biol. Ecol. 4: 119-133.

GRAY, J.S. and RIEGER, R.M. (1971). A quantitative study of the meiofauna of an exposed sandy beach, at Robin Hood's Bay, Yorkshire. J. mar. biol. Ass. U.K. 51: 1-19.

GRAY, T.R.G. (1967). Stereoscan electron microscopy of soil micro-organisms. Science, N.Y. 155: 1668-1670.

GREEN, J. (1968). The Biology of Estuarine Animals. Sidgwick and Jackson: London.

GREENLAND, D.J., LINDSTROM, G.R. and QUIRK, J.P. (1961). Role of polysaccharides in stabilization of natural soil aggregates. Nature, Lond. 191: 1283-1284.

GROSS-GRANT, M. (1971). Carbon determination. pp. 573-596. In: Procedures in Sedimentary Petrology. Ed. R.E. Carver. Wiley Interscience: New York and London.

GUST, G. and HARRISON, J.T. (1981). Biological pumps at the sediment-water interface. Mechanistic evaluation of the Alphaeid shrimp Alpheus mackayi and its irrigation pattern. Mar. Biol. 64: 71-78.

HAGERTY, R. (1974). Usefulness of spade cores for geotechnical studies and some results from the north-east Pacific. pp. 169-186. In: Deep-Sea Sediments. Ed. A.L. Inderbitzen. Plenum Press: New York.

HAHN, H.H. and STUMM, W. (1970). The role of coagulation in natural waters. Am. J. Sci. 268: 354-368.

HALLERMEIER, R.J. (1981). Terminal settling velocity of commonly occurring sand grains. Sedimentology 28: 859-865.

HARLEY, M.B. (1950). Occurrence of a filter feeding mechanism in the polychaete Nereis diversicolor. Nature, Lond. 165: 734-735.

HART, T.J. (1930). Preliminary notes on the bionomics of the amphipod Corophium volutator (Pallas). J. mar. biol. Ass. U.K. 16: 761-789.

HAWORTH, W.N., PINKARD, F.W. and STACEY, M. (1946). Function of bacterial polysaccharides in the soil. Nature, Lond. 158: 836-837.

HAYES, M.H.B. (1980). The role of natural and synthetic polymers in stabilising soil aggregates. pp. 263-296. In: Microbial Adhesion to Surfaces. Ed. R.C.W. Barkeley, J.M. Lynch, J. Melling, P.R. Rutter and B. Vincent. Ellis Horwood: Chichester.

HAYES, M.O. (1975). Morphology of sand accumulation in estuaries: an introduction to the symposium. In: Estuarine Research. Ed. L.E. Cronin. Academic Press: New York and London.

HAZEN, A. (1914). Storage to be provided in impounding reservoirs for municipal water supply. Trans. Am. Soc. Civil Eng. 77: 1539-1669.

HEATH, G.W. (1974). Synopsis. pp. 1-2. In: The Clyde Estuary and Firth, an Assessment of Present Knowledge Compiled by Members of the Clyde Study Group. The Natural Environment Research Council Publications. Series C, No. 11.

HEDGES, J.I. and PARKER, P.L. (1976). Land-derived organic matter in surface sediments from the Gulf of Mexico. Geochimica Cosmochim. Acta 40: 1019-1029.

HJULSTRÖM, F. (1935). Studies on the morphological activity of rivers as illustrated by the River Fyris. Uppasala Bull. geol. Inst. Univ. 25: 221-527.

HJULSTRÖM, F. (1939). Transportation of detritus by moving water: A symposium. pp. 5-31. In: Recent Marine Sediments. Ed. P.D. Trask. American Association of Petroleum Geologists, Tulsa, Oklahoma, Thomas Murby: London.

HOSBEN, L.A. and MENZEL, D.W. (1969). The distribution and chemical composition of organic particulate matter in the sea and sediments of the east coast of South America. Limnol. Oceanogr. 14: 159-163.

HOLLAND, A.F., ZINGMARK, R.G. and DEAN, J.M. (1974). Quantitative evidence concerning the stabilization of sediments by marine benthic diatoms. Mar. Biol. 27: 191-196.

HOLME, N.A. (1949). The fauna of sand and mud banks near the mouth of the Exe Estuary. J. mar. biol. Ass. U.K. 28: 189-238.

HOLME, N.A. and McINTYRE, A.D. (1984). Methods for the Study of Marine Benthos. I.B.P. Handbook No. 16. Blackwell: Oxford and Edinburgh.

HOLMES, C.W. and GOODELL, H.G. (1964). The prediction of strength in the sediments of St Andrew Bay, Florida. J. sedim. Petrol. 34: 134-143.

HOWES, B.L., HOWARTH, R.W., TEAL, J.M. and VALIELA, I. (1981). Oxidation-reduction potentials in a salt marsh: spatial patterns and interactions with primary production. Limnol. Oceanogr. 26: 350-360.

HULSEY, J.D. (1961). Relations of settling velocity of sand sized spheres and sample weight. J. sedim. Petrol. 31: 101-112.

HUNT, S. (1970). Polysaccharide - Protein Complexes in Invertebrates. Academic Press: New York and London.

HUNTER, K.A. and LISS, P.S. (1979). The surface charge of suspended particles in estuarine and coastal water. Nature, Lond. 282: 823-825.

HUNTER, K.A. and LISS, P.S. (1982). Organic matter and the surface charge of suspended particles in estuarine waters. Limnol. Oceanogr. 27: 322-335.

HYLLEBERG KRISTENSEN, J. (1972). Carbohydrases of some marine invertebrates with notes on their food and on the natural occurrence of the carbohydrates studied. Mar. Biol. 14: 130-142.

INDERBITZEN, A.L. (Edit) (1974). Deep-Sea Sediment: Physical and Chemical Properties. Plenum Press: New York and London.

INMAN, D.L. (1952). Measures for describing the size distribution of sediments. J. sedim. Petrol. 22: 125-145.

JANSSON, B.O. (1967). The significance of grain size and pore water content for the interstitial fauna of sandy beaches. Oikos 18: 311-322.

JOHNSON, R.G. (1971). Animal-sediment relations in shallow water benthic communities. Mar. Geol. 11: 93-104.

JONES, R.H. (1966). Oxidation-reduction potential measurements. Instr. Soc. Am. J. 13: 40-44.

JOPLING, A.V. (1964). Interpreting the concept of the sedimentation unit. J. sedim. Petrol. 34: 165-172.

JUMIKIS, A.R. (1962). Soil Mechanics. Van Nostrand: Princeton and New Jersey.

KAESTNER, A. (1967). Invertebrate Zoology. Interscience Publishers: New York and London.

KAJIHARA, M. (1971). Settling velocity and porosity of large suspended particles. J. Oceanogr. Soc. Japan 27: 158-162.

KATZ, L.C. (1980). Effects of burrowing by the fiddler crab, Uca pugnax (Smith). Estuar. Coast. Mar. Sci. 11: 233-237.

KELLER, G.H. (1974). Marine geotechnical properties: interrelationships and relationships to depth burial. pp. 77-100. In: Deep-Sea Sediments, Physical and Chemical Properties. Ed. A.L. Inderbitzen. Plenum Press: New York and London.

KENDALL, M.A. (1979). The stability of the deposit feeding community of a mud flat in the River Tees. Estuar. Coast. Mar. Sci. 8: 15-22.

KENNEDY, V.A. (1984). The Estuary as a Filter. Academic Press: New York and London.

KIKUCHI, E. and KURIHARA, Y. (1977). In vitro studies on the effects of tubificids on the biological, chemical and physical characteristics of submerged rice field soil and overlying water. Oikos 29: 348-356.

KOSTALOS, M. and SEYMOUR, R.L. (1976). Role of microbial enriched detritus in the nutrition of Gammarus minus (Amphipoda). Oikos 27: 512-516.

KRANK, K. (1973). Flocculation of suspended sediment in the sea. Nature, Lond. 246: 348-350.

KRANK, K. (1975). Sediment deposition from flocculated suspension. Sedimentology 22: 111-123.

KRANK, K. (1981). Particulate matter, grain-size characteristics and flocculation in a partially mixed estuary. Sedimentology 28: 107-114.

KRUMBEIN, W.C. and PETTIJOHN, F.J. (1938). Manual of Sedimentary Petrography. Appleton-Century-Crofts: New York.

KRYVI, H. (1971). Histology and histochemistry of the mucous glands of Sabella penicillum L. (Annelida, Polychaeta). Norwegian J. Zool. 19: 37-44.

KUENEN, PH.H. (1968). Settling convection and grain-size analysis. J. sedim. Petrol. 38: 817-831.

LAMBE, T.W. and WHITMAN, R.V. (1979). Soil Mechanics, SI Version. John Wiley and Sons: New York and Chichester.

LAMBIASE, J.J. (1980). Hydraulic control of grain-size distribution in a macrotidal estuary. Sedimentology 27: 433-446.

LANE, E.W. (1938). Notes on the formation of sand. Trans. Am. geophys. Un. 19: 505-508.

LANGHORNE, D.N. (1982). A study of the dynamics of a marine sand wave. Sedimentology 29: 571-594.

LANGMUIR, D. (1971). Eh-pH determination. pp. 597-634. In: Procedures in Sedimentary Petrology. Ed. R.E. Carver. Wiley Interscience: New York and London.

LARSEN, L.H., STERNBERG, R.W., SHI, N.C., MARSDEN, M.A.H. and THOMAS, L. (1981). Field investigations of the threshold of grain motion by ocean waves and currents. Mar. Geol. 42: 105-132.

LAUFF, G.H. (Edit) (1967). Estuaries. American Association for the Advancement of Science (Am. Ass. Adv. Sci. No.83). Washington D.C.

LEE, H. and SWARTZ, R.C. (1980). Biological processes affecting the distribution of pollutants in marine sediments. Part II. Biodeposition and bioturbation. pp. 555-606. In: Contaminants and Sediments Analysis, Chemistry, Biology (Vol. 2). Ed. R.A. Baker. Ann Arbo Science Publishers, Inc., Michigan, U.S.A.

LEE, H.J. (1982). Bulk density and shear strength of several deep-sea calcareous sediments. pp. 54-78. In: Geotechnical Properties, Behaviour and Performance of Calcareous Soils. Eds. K.R. Demars and R.C. Chaney. Am. Soc. Test. Mat. (ASTM).

LEEDER, M.R. (1982). Sedimentology. Allen and Unwin: London.

LEHNINGER, A.L. (1975). Biochemistry (2nd Edition). Worth Publishers: New York.

LETZSCH, W.S. and FREY, R.W. (1980). Erosion of slatmarsh tidal creek branks, Sapelo Island, Georgia. Senckenberg. marit. 12: 201-222.

LEVINTON, J.S. (1982). Marine Ecology. Prentice-Hall: New Jersey, U.S.A.

LINCOLN, R.J. (1979). British Marine Amphipoda: Gammaridea. British Museum (Natural History): London.

LLOYD, B. (1930). Bacteria of the Clyde Sea Area: a quantitative investigation. J. mar. biol. Ass. U.K. 16: 879-907.

LLOYD, B. (1931). Muds of the Clyde Sea Area. II. Bacterial content. J. mar. biol. Ass. U.K. 17: 751-765.

LOCKWOOD, A.P.M. (1968). Aspects of the Physiology of Crustacea. Oliver and Boyd: Edinburgh and London.

LONGBOTTOM, M.R. (1970). The distribution of Arenicola marina (L) with particular reference to the effects of particle size and organic matter of the sediments. J. Exp. Mar. Biol. Ecol. 5: 138-158.

LOWE, D.R. (1976). Subaqueous liquified and fluidised sediment flows and their deposits. Sedimentology 23: 285-308.

LYNCH, J.M. and POOLE, N.J. (1979). Microbial Ecology. Blackwell: London and Edinburgh.

LYNCH, M.P. and HARRISON, W. (1970). Sedimentation caused by a tube-building amphipod. J. sedim. Petrol. 40: 434-435.

McCAFFREY, R.J., MYRES, A.C., DAVEY, E., MORRISON, G., BENDER, M., LUEDTKE, N., CULLEN, D., FROELICH, P. and KLINKHAMMER, G. (1980). The relationship between pore water chemistry and benthic fluxes of nutrients and manganese in Narrangansett Bay, Rhode Island. Limnol. Oceanogr. 25: 31-44.

McCALL, P.L. (1979). The effects of deposit feeding oligochaetes on particle size and settling velocity of Lake Erie sediment. J. sedim. Petrol. 49: 0813-0818.

McCALL, P.L. and TEVESZ, M.J.S. (1982). Animal-Sediment Relations: The Biogenic Alteration of Sediments. Plenum Press: New York.

McCALLUM, M.F. (1969). Faecal indicators in sea water. Proc. Challenger Soc. 4: 14-15.

McCAVE, I.N. (1970). Deposition of fine-grained suspended sediment from tidal currents. J. geophys. Res. 75: 4151-4159.

McCAVE, I.N. (1984). Erosion, transport and deposition of fine-grained marine sediments. pp. 35-69. In: Fine-Grained Sediments: Deep

Water Processes and Facies. Eds. D.A.V. Stow and D.J.W. Piper. Published for the Geological Society. Blackwell Scientific Publications: Oxford, London, Edinburgh.

McLUSKY, D.S. (1981). The Estuarine Ecosystems. Blackie: Glasgow and London.

McMASTER, R.L. (1967). Compactness variability of estuarine sediments: an in situ study. pp. 261-267. In: Estuaries. Ed. G.H. Lauff. American Association for the Advancement of Science, Washington D.C.

MACGINITIE, G.E. (1978). The role of bacteria as food for bottom animals. Science, N.Y. 76: 490.

MACGINITIE, G.E. and MACGINITIE, N. (1968). Natural History of Marine Animals. McGraw-Hill: New York and London.

MANTZ, P.A. (1978). Bedforms produced by fine, cohesionless, granuler and flakey sediments under subcritical water flows. Sedimentology 25: 83-103.

MARSHALL, A.J. and WILLIAMS, W.D. (1972). Textbook of Zoology: Invertebrates. Macmillan: London and Basingstoke.

MARTIN, J.P. (1945). Microorganisms and soil aggregation. I. Origin and nature of some of the aggregating substances. Soil Sci. 59: 163-174.

MARTIN, J.P. (1946). Microorganisms and soil aggregation. II. Influence of bacterial polysaccharides on soil structures. Soil Sci. 61: 157-166.

MARTIN, J.P. and WAKSMAN, S.A. (1940). Influence of microorganisms on soil aggregation and erosion. Soil Sci. 50: 29-47.

MASSEY, B.S. (1979). Mechanics of Fluids (4th Edition). Van Nostrand Reinhold Company, Inc.: Princeton and New Jersey.

MEADOWS, P.S. (1964a). Experiments on substrate selection by Corophium species: films and bacteria on sand particles. J. exp. Biol. 41: 499-511.

MEADOWS, P.S. (1964b). Experiments on substrate selection by Corophium volutator (Pallas): depth selection and population density. J. exp. Biol. 41: 677-687.

MEADOWS, P.S. (1964c). Substrate selection by Corophium species: the particle size of substrates. J. Anim. Ecol. 33: 387-394.

MEADOWS, P.S. (1965). Attachment of marine and freshwater bacteria to solid surfaces. Nature, Lond. 207: 1108.

MEADOWS, P.S. and ANDERSON, J.G. (1966). Micro-organisms attached to marine and freshwater sand grains. Nature, Lond. 212: 1059-1060.

MEADOWS, P.S. and ANDERSON, J.G. (1968). Micro-organisms attached to marine sand grains. J. mar. biol. Ass. U.K. 48: 161-175.

MEADOWS, P.S. and CAMPBELL, J.I. (1972a). Habitat selection and animal distribution in the sea: the evolution of a concept. Proc. R. Soc. Edinb. (B) 73: 145-157.

MEADOWS, P.S. and CAMPBELL, J.I. (1972b). Habitat selection by aquatic invertebrates. pp. 271-382. In: Advances in Marine Biology. Eds. Sir F.S. Russell and Sir M. Yonge. Volume 10. Academic Press: London and New York.

MEADOWS, P.S. and CAMPBELL, J.I. (1978). An Introduction to Marine Science. Blackie: Glasgow and London.

MEADOWS, P.S. and REID, A. (1966). The behaviour of Corophium volutator (Crustacea: Amphipoda). J. Zool. Lond. 150: 387-399.

MEADOWS, P.S. and TAIT, J. (1985). Bioturbation, geotechnics and microbiology at the sediment-water interface in deep-sea sediments. Proc. 19th European Mar. Biol. Symp.: 191-199.

MEADOWS, P.S. and WILLIAMS, G.R. (1963). Settlement of Spirorbis borealis Daudin larvae on surfaces bearing films of micro-organisms. Nature, Lond. 198: 610-611.

MILLER, M.C., McCAVE, I.N. and KOMAR, P.D. (1977). Threshold of sediment motion under unidirectional currents. Sedimentology 24: 507-527.

MIRONER, A. (1979). Engineering Fluid Mechanics. McGRaw-Hill Book Company: New York and London.

MITCHELL, R. (1968). The effect of water movement on lysis of non-marine microorganisms by marine bacteria. Sarsia 34: 263-266.

MOORE, D.G. (1964). Shear strength and related properties of sediments from experimental mohole (Guadalupe site). J. geophys. Res. 69: 4271-4291.

MOORE, H.B. (1931). The muds of the Clyde Sea Area. III. Chemical and physical conditions; rate and nature of sedimentation and fauna. J. mar. biol. Ass. U.K. 17: 325-358.

MOORE, H.B. (1958). Marine Ecology. Wiley: New York and Chichester.

MORGAN, E. (1970). The effects of environmental factors on the distribution of the amphipod Pectenogammarus planicrurus with particular reference to grain size. J. mar. biol. Ass. U.K. 50: 769-785.

MORONEY, M.J. (1951). Facts from Figures. Penguin Books: Baltimore and Maryland.

MORTIMER, C.H. (1941). The exchange of dissolved substances between mud and water in lakes. I and II. J. Ecol. 29: 280-329.

MOSHIRI, G.A. and CRUMPTON, W.C. (1978). Some aspects of redox trends in the bottom muds of mesotrophic Bayou Estuary. Hydrobiologia 57: 155-158.

MURRAY, S., CONLON, D., SIRIPONG, A. and SANTORO, J. (1975). Circulation and salinity distribution in the Rio Guayas Estuary, Ecuador. pp. 345-363. In: Estuarine Research. Ed. L.E. Cronin. Academic Press: New York and London.

MYERS, A.C. (1972). Tube-worm-sediment relationships of Diopatra cuprea (Polychaeta-Onuphidae). Mar. Biol. 17: 350-356.

NEBESKI, O. (1880). Beiträge zur Kenntniss der Amphipoden der Adria. Arb. zool. Inst. Univ. Wien. 3: 27-78.

NEDWELL, D.B. and BROWN, C.M. (1982). Sediment Microbiology. Academic Press: New York and London.

NEIHOF, R.A. and LOEB, G.I. (1972). The surface charge of particulate matter in sea water. Limnol. Oceanogr. 17: 7-16.

NEUMANN, A.C., GEBELEIN, C.D. and SCOFFIN, T.P. (1970). The composition, structure and erodibility of subtidal mats, ABACO, Bahamas. J. sedim. Petrol. 40: 274-297.

NEWELL, G.E. (1948). A contribution to our knowledge of the life history of Arenicola marina L. J. mar. biol. Ass. U.K. 27: 554-580.

NEWELL, R.C. (1965). The role of detritus in the nutrition of two marine deposit-feeders, the prosobranch Hydrobia ulvae and the bivalve Macoma baltica. Proc. zool. Soc. Lond. 144: 25-45.

NEWELL, R.C. (1970). Biology of Intertidal Animals. Logos Press: London.

NICHOLS, F.H. (1970). Benthic polychaete assemblage and their relationship to the sediment in Port Madison, Washington. Mar. Biol. 6: 48-58.

NICHOLS, F.H. (1974). Sediment turnover by a deposit-feeding polychaeta. Limnol. Oceanogr. 19: 945-950.

NICKLING, W.G. and ECCLESTON, M. (1981). The effects of soluble salts on the threshold shear velocity of fine sand. Sedimentology 28: 505-510.

NICOL, J.A.C. (1960). The Biology of Marine Animals. Pitman: London.

NIELSEN, M.V. and KOFOED, L.H. (1982). Selective feeding and episammic browsing by the deposit-feeding amphipod Corophium volutator. Mar. Ecol. Prog. Ser. 10: 81-88.

NOWELL, A.R.M., JUMARS, P.A. and ECKMAN, J.A. (1981). Effect of biological activity on the entrainment of marine sediment. Mar. Geol. 42: 133-153.

ODUM, E.P. (1959). Fundamentals of Ecology (2nd Edition). W.B. Saunders Company: Philadelphia and London.

OTT, J.A., FUCHS, B., FUCHS, R. and MALASEK, A. (1976). Observations on the biology of Callianassa stebbengi Borradaille and Upogebia littoralis Risso and their effect upon the sediment. Senckenberg. marit. 8: 61-79.

OTTO, G.H. (1938). The sedimentation unit and its use in field sampling. J. Geol. 46: 569-582.

OXOID MANUAL (3rd Edition) (1976). The Oxoid Manul of Culture Media, Ingredients and other Laboratory Services. Oxoid Ltd., Basingstoke.

PACKHAM, R.F. (1962). The coagulation process. I. Effect of pH and the nature of the turbidity. J. appl. Chem. 12: 556-564.

PAMATMAT, M.M. (1968). Ecology and metabolism of a benthic community on an intertidal sandflat. Int. Revue ges. Hydrobiol. 53: 211-298.

PARTHENIADES, E. (1965). Erosion and deposition of cohesive soils. Proc. Am. Soc. civ. Engrs. 91: HYI: 105-139.

PEARSON, T.H. and STANLEY, S.O. (1979). Comparative measurement of the redox potential of marine sediments as a rapid means of assessing the effect of organic pollution. Mar. Biol. 53: 371-379.

PIERCE, T.J. and WILLIAMS, D.J. (1966). Experiments on certain aspects of sedimentation of estuarine muds. Proc. Instn. civ. Engrs. 34: 391-402.

PERKINS, E.J. (1958). The food relationships of the microbenthos, with particular reference to that found at Whitstable, Kent. Ann. Mag. nat. Hist. 13: 64-77.

PERKINS, E.J. (1974). The Biology of Estuaries and Coastal Waters. Academic Press: New York and London.

PHILLIPS, P.J. (1971). Observations on the biology of mud shrimps of the genus Callianassa (Anomura: Thalassinidea) in Mississippi Sound. Gulf Res. Rep. 3: 165-196.

POSTMA, H. (1967). Sediment transport and sedimentation in the estuarine environment. pp. 158-179. In: Estuaries. Ed. G.H. Lauff. American Association for the Advancement of Science, Washington, D.C.

POWELL, E.N. (1977). Particle size selection and sediment reworking in a faunal feeder, Leptosynapta tenuis (Holothuroides, Synaptidae). Int. Revue ges. Hydrobiol. 62: 385-408.

PRAKASH, S. (1981). Soil Dynamics. McGraw-Hill Book Company: New York and London.

PRAVDIC, V. (1970). Surface charge characterization of sea sediments. Limnol. Oceanogr. 15: 230-233.

PRITCHARD, D.W. (1960). Estuaries. In: Encyclopedia of Science and Technology. McGraw-Hill: New York and London.

REHEMTULLA, F. and LØVTRUP, S. (1974). The comparative biochemistry of invertebrate mucopolysaccharides. II. Nematoda; Annelida. Comp. Biochem. Physiol. 49B: 639-646.

REES, C.P. (1975). Competitive interactions and substratum preferences of two intertidal isopods. Mar. Biol. 30: 21-27.

REICE, S.R. (1977). The role of animal associations and current velocity in sediment-specific leaf litter decomposition. Oikos 29: 357-365.

REINECK, H.E. and SINGH, I.B. (1980). Depositional Sedimentary Environments. Springer-Verlag: Berlin, Heidelberg, New York.

REMANE, A. (1958). Okologie des Brackwassers. In: Die Biologie des Brachwassers. Schweizerbartsche Verlag: Stuttgart.

REYNOLDS, O. (1883). An experimental investigation of the circumstances which determine whether the motion of water shall be direct or sinuous, and of the law of resistance in parallel channels. Proc. R. Soc. 35: 84-99.

RHEINHEIMER, G. (1977). Microbial Ecology of a Brackish Water Environment. Springer-Verlag: Berlin, Heidelberg, New York.

RHOADS, D.C. (1963). Rates of reworking by Yoldia limatula in Buzzards Bay, Massachusetts and Long Island Sound. J. sedim. Petrol. 33: 723-727.

RHOADS, D.C. (1967). Biogenic reworking of intertidal and subtidal sediments in Barnstable Harbor and Buzzards Bay, Massachusetts. J. Geol. 75: 461-476.

RHOADS, D.C. (1970). Mass properties, stability, and ecology of marine muds related to burrowing activity. pp. 391-406. In: Trace Fossils. Eds. J.P. Crimes and J.C. Harpper. Seel House Press: Liverpool.

RHOADS, D.C. (1974). Organism-sediment relationships on the muddy sea floor. Oceanogr. Mar. Biol. Ann. Rev. 12: 263-300.

RHOADS, D.C., ALLER, R.C. and GOLDHABER, M.B. (1977). The influence of colonizing benthos on physical properties and chemical diagenesis of the estuarine sea floor. pp. 113-138. In: Ecology of Marine Benthos. Ed. B.C. Coull. University of South Carolina Press: Columbia, South Carolina.

RHOADS, D.C., YINGST, J.Y. and ULLMAN, W.J. (1978). Seafloor stability in central Long Island Sound: Part I. Temporal changes in erodibility of fine-grained sediment. pp. 221-244. In: Estuarine Interactions. Ed. M.L. Wiley. Academic Press: London and New York.

RHOADS, D.C. and YOUNG, D.K. (1970). The influence of deposit-feeding organisms on sediment stability and community trophic structure. J. mar. Res. 28: 150-178.

RHOADS, D.C. and YOUNG, D.K. (1971). Animal-sediment relations in Cape Cod Bay, Massachusetts. II: Reworking by Molpadia oolitica (Holothuroidea). Mar. Biol. 11: 255-261.

RICHARDS, K.S. (1973). The histochemistry of the large granular, orthochromatic, mucous cells of some lumbricids (Annelida: Oligochaeta). Annls. Histochim. 18: 289-300.

RICHARDS, K.S. (1974a). The histochemistry of the metachromatic mucous cells of some lumbricids (Annelida: Oligochaeta). Annls. Histochim. 19: 187-197.

RICHARDS, K.S. (1974b). The histochemistry of the small granular, proteinaceous cells (albumen cells) of the epidermis of some lumbricids (Annelida: Oligochaeta). Annls. Histochim. 19: 239-251.

RICHARDS, K.S. (1978). Epidermis and cuticles. pp. 33-61. In: Physiology of Annelids. Ed. P.J. Mill. Academic Press: New York and London.

RICHARDSON, A.F. and PARKS, J.M. (1976). Marine geotechnology: average sediment properties, selected literature and review of consolidation, stability and bioturbation - geotechnical interactions in the benthic boundary layer. pp. 157-181. In: The Benthic Boundary Layer. Ed. I.N. McCave. Plenum Press: New York.

RICHARDSON, J.F. and ZAKI, W.N. (1954). Sedimentation and fluidisation. Trans. Instn. chem. Engrs. 32: 35-51.

RISK, M.J. and SZCZUCZKO, R.B. (1977). A method for staining trace fossils. J. sedim. Petrol. 47: 855-859.

ROHLF, F.J. and SOKAL, R.R. (1969). Statistical Tables. W.H. Freeman and Company: San Francisco.

ROWE, G.T. (1974). The effects of the benthic fauna on the physical properties of deep-sea sediments. pp. 381-400. In: Deep-Sea Sediments. Ed. A.L. Inderbitzen. Plenum Press: New York and London.

RUBEY, W.W. (1933). Settling velocities of gravel, sand and silt particles. Am. J. Sci. 25: 325-338.

RUSSELL, R.D. and TAYLOR, R.E. (1937). Roundness and shape of Mississippi river sands. J. Geol. 45: 225-267.

SANDERS, H.L. (1958). Benthic studies in Buzzards Bay. I. Animal-sediment relationships. Limnol. Oceangr. 3: 245-258.

SCHÄFER, W. (1972). Ecology and Palaeoecology of Marine Environments. Oliver and Boyd: Edinburgh.

SCOFFIN, T.P. (1970). The trapping and binding of subtidal carbonate sediments by marine vegetation in Bimini Lagoon, Bahamas. J. sedim. Petrol. 40: 249-273.

SEGERSTALE, S.G. (1959). Synopsis of data on the crustaceans Gammarus locusta, Gammarus oceanaicus, Pontoporeia affinis and Corophium volutator (Amphipoda, Gammaridea). Commentat. biol. 20: 1-23.

SEIBOLD, E. and BERGER, W.H. (1982). The Sea Floor. Springer-Verlag: Berlin, Heidelberg and New York.

SENGUPTA, S. (1979). Grain-size distribution of suspended load in relation to bed materials and flow velocity. Sedimentology 26:

63-82.

SETTLEMYRE, J.L. and GARDNER, L.R. (1977). Suspended sediment flux through a salt marsh drainage basin. Estuar. Coast. Mar. Sci. 5: 653-663.

SHIELDS, A. (1936). Anwendung der Ahnlichkeits meschanik und der Turbulentzforschung auf die Geschiebebewegung. In: (W.P. Ott and J.C. van Uchelen (Translators); Calif. Inst. Technol., W.M. Keck Lab. Hydraul. Water Resour. Rep., 167). Mitt. Preuss Versuchsanst. Wasserbau Schiffnau. 26: 20.

SHILLAKER, R.O. and MOORE, P.G. (1978). Tube building by the amphipods Lembos websteri Bate and Corophium bonnellii Milne Edwards. J. Exp. Mar. Biol. Ecol. 33: 169-187.

SHOLKOVITZ, E.R. (1976). Flocculation of dissolved organic and inorganic matter during the mixing of river water and sea water. Geochem. cosmochim. Acta 40: 831-845.

SIEBURTH, J. McN. (1967). Seasonal selection of estuarine bacteria by water temperature. J. Exp. Mar. Biol. Ecol. 1: 98-123.

SKUTCH, A.F. (1926). On the habits and ecology of the tube building amphipod Amphithoe rubricata, Montagu. Ecology 7: 481-502.

SMITH, M.J. (1981). Soil Mechanics (4th Edition). George Godwin: London.

SMITH, N.D. and SYVITSKI, J.P.M. (1982). Sedimentation in a glacier-fed lake: the role of pelletization on deposition of fine-grained suspensates. J. sedim. Petrol. 52: 0503-0513.

SMITH, R.I. (1955). Salinity variation in interstitial water of sand at Kames Bay, Millport, with reference to the distribution of

Nereis diversicolor. J. mar. biol. Ass. U.K. 34: 33-46.

SMYTH, J.C. (1974). Flora and fauna of the Clyde Estuary. pp. 40-42. In: The Clyde Estuary and Firth: An Assessment of Present Knowledge Compiled by Members of the Clyde Study Group. The Natural Environment Research Council Publications, Series C, No. 11.

SNEDECOR, G.W. and COCHRAN, W.G. (1980). Statistical Methods (7th Edition). The Iowa State University Press: Ames, Iowa.

SOCCI, A. and TANNER, W.F. (1980). Short communications: Little known but important papers on grain-size analysis. Sedimentology 27: 231-232.

SOROKIN, Ju. I. (1975). Sulphide formation and chemical composition of bottom sediments of some Italian lake. Hydrobiologia 47: 231-240.

SOUTHARD, J.B. (1974). Erodibility of fine abyssal sediment. pp. 367-379. In: Deep-Sea Sediments. Ed. A.L. Inderbitzen. Plenum Press: New York and London.

SPOONER, G.M. and MOORE, H.B. (1940). The ecology of the Tamar Estuary. VI. An account of the macrofauna of the intertidal muds. J. mar. biol. Ass. U.K. 24: 283-330.

STANIER, R.Y., ADELBERG, E.A. and INGRAHAM, J.L. (1977). General Microbiology (4th Edition). Macmillan: London and Basingstoke.

STEIDTMANN, J.R. (1982). Size-density sorting of sand-size spheres during deposition from bedload transport and implications concerning hydraulic equivalence. Sedimentology 29: 877-883.

STEPHEN, A.C. (1930). Studies on the Scottish marine fauna, additional

observations on the fauna of the sandy and muddy areas of the tidal zone. Trans. R. Soc. Edinb. 56: 521-535.

STEVENSON, L.H. and COLWELL, R.R. (Eds) (1973). Estuarine Microbial Ecology. University of South Carolina Press: Columbia, South Carolina.

STOCK, J.H. (1952). Some notes on the taxonomy, the distribution and the ecology of four species of the amphipod genus Corophium (Crustacea: Malacostraca). Beaufortia 21: 1-10.

STRICKLAND, J.D.H. and PARSONS, T.R. (1972). A Practical Handbook of Seawater Analysis. Fisheries Research Board of Canada: Ottawa.

STRYER, L. (1975). Biochemistry (2nd Edition). Freeman: San Francisco.

SUNDBORG, F.A. (1956). The River Klarälven, a study on fluvial processes. Geogr. Annlr. 38: 125-316.

SUTHERLAND, I.W. (1980). Polysaccharides in the adhesion of marine and freshwater bacteria. pp. 329-338. In: Microbial Adhesion to Surfaces. Eds. R.C.W. Berkely, J.M. Lynch, J. Melling, P.R. Rutter and B. Vincent. Ellis Horwood: Chichester.

SWIFT, D.J.P., SCHUBEL, J.R. and SHELDON, R.W. (1972). Size analysis of fine grained suspended sediments: a review. J. sedim. Petrol. 42: 122-134.

SWINBANKS, D.D. and MURRAY, J.W. (1981). Biosedimentological zonation of Boundary Bay tidal flats, Fraser River Delta, British Columbia. Sedimentology 28: 201-237.

TANNER, W.F. (1964). Modification of sediment size distributions. J. sedim. Petrol. 34: 156-164.

TEAL, J.M. (1958). Distribution of fiddler crabs in Georgia salt marshes. Ecology 39: 185-193.

TEBBUTT, T.H.Y. (1983). Principles of Water Quality Control (3rd Edition). Pergamon Press: Oxford and New York.

TEVESZ, M.J.S., SOSTER, F.M. and McCALL, P.L. (1980). The effect of size selective feeding by oligochaetes on the physical properties of river sediments. J. sedim. Petrol. 50: 561-568.

THAMDRUP, H.M. (1935). Beiträge Zur okologie der wattenfauna auf experimenteller Grundlage. Medd. Komm. Hav. Fisk. 10: 1-125.

TISSOT, B.P. and WELTE, D.H. (1978). Petroleum Formation and Occurrence. Springer-Verlag: Berlin, Heidelberg, New York.

TRASK, P.D. and ROLSTON, J.W. (1950). Relation of strength of sediments to water content and grain size. Science, N.Y. 111: 666-667.

TREVOR, J.H. (1977). The burrowing of Nereis diversicolor (O.F. Müller), together with some observations on Arenicola marina (L) (Annelida: Polychaeta). J. Exp. Mar. Biol. Ecol. 30: 129-145.

VAN OLPHEN, H. (1966). An Introduction to Clay Colliod Chemistry. Interscience: New York and London.

van STRAATEN, L.M.J.U. and KUENEN, PH.H. (1958). Tidal action as a cause of clay accumulation. J. sedim. Petrol. 28: 406-413.

VISHER, G.S. (1969). Grain size distribution and depositional processes. J. sedim. Petrol. 39: 1074-1106.

VOVELLE, J. (1973). Evolution de la taille des grains du tube arenace en fonction de la Crolssance Chez Pectinaria (Lagis) Koreni Malmgren (Polychaete: Sedentaire). Ophelia 10: 169-184.

WADELL, H. (1934). Some new sedimentation formulas. Physics. 5: 281-291.

WAKSMAN, S.A. and MARTIN, J.P. (1939). The role of microorganisms in the conservation of the soil. Science, N.Y. 90: 304-305.

WALKLEY, A. and BLACK, I.A. (1934). An examination of the Degtjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. Soil Sci. 37: 29-38.

WALSHAW, A.C. and JOBSON, D.A. (1972). Mechanics of Fluids (2nd Edition). Longman: London.

WANG, Y., PIPER, D.J.W. and VILKS, G. (1982). Surface textures of turbidite sand grains, Laurentian Fan and Sohm Abyssal Plain. Sedimentology 29: 727-736.

WASLENCHUK, D.G., MATSON, E.A., ZAJAC, R.N., DOBBS, F.C. and TRAMONTANO, J.M. (1983). Geochemistry of burrow waters vented by a bioturbating shrimp in Bermudian sediments. Mar. Biol. 72: 219-225.

WATKINS, E.E. (1941). The yearly life cycle of the amphipod Corophium volutator. J. Anim. Ecol. 10: 77-93.

WEBB, J.E. (1969). Biologically significant properties of submerged marine sands. Proc. R. Soc. Lond. 174(B): 355-402.

WHITEHOUSE, U.G., JEFFREY, L.M. and DEBBRECHT, J.D. (1960). Differential settling tendencies of clay minerals in saline waters. pp. 1-79. (Proc. 7th Conf. Clays. Clay Min.). In: Clays and Clay Minerals. Edit. E. Ingerson. Pergamon Press: London and New York.

WHITEFIELD, M. (1969). Eh as an operational parameter in estuarine studies. Limnol. Oceanogr. 14: 547-558.

WHITLACH, R.B. (1981). Animal-sediment relationships in intertidal marine benthic habitats: some determinants of deposit-feeding species diversity. J. Exp, Mar. Biol. Ecol. 53: 31-45.

WIESER, W. (1956). Factors influencing the choice of substratum in Cumella vulgaris Hart (Crustacea: Cumacea). Limnol. Oceanogr. 1: 274-284.

WIESER, W. (1959). The effect of grain size on the distribution of small invertebrates inhabiting the beaches of Puget Sound. Limnol. Oceanogr. 4: 181-194.

WILEY, M. (Edit) (1976). Estuarine Processes: Uses, Stresses, and Adaptation to the Estuary (Vol. I). Academic Press: New York, San Francisco, London.

WILEY, M. (Edit) (1976). Estuarine Processes: Circulation, Sediments, and Transfer of Material in the Estuary (Vol. II). Academic Press: New York, San Francisco, London.

WILEY, M.L. (Edit) (1978). Estuarine Interactions. Academic Press: New York, San Francisco, London.

WILSON, D.P. (1955). The role of microorganisms in the settlement of Ophelia bicormis Savigny. J. mar. biol. Ass. U.K. 34: 531-543.

WINDLOZ, M. (Edit) (1976). The Merck Index: An Encyclopedia of Chemicals and Drugs (9th Edition). Merck: Rahway, New Jersey.

WINKELMOLEN, A.M. (1982). Critical remarks on grain parameters, with special emphasis on shape. Sedimentology 29: 255-265.

WINSTON, J.E. and ANDERSON, F.E. (1971). Bioturbation of sediments in a northern temperate estuary. Mar. Biol. 10: 39-49.

WOOD, E.J.F. (1965). Marine Microbial Ecology. Chapman and Hall: London and New York.

WOODIN, S.A. (1974). Polychaete abundance patterns in a marine soft-sediment environment: the importance of biological interactions. Ecol. Monogr. 44: 171-187.

YINGST, J.Y. (1976). The utilization of organic matter in shallow marine sediments by an epibenthic deposit-feeding holothurian. J. Exp. Mar. Biol. Ecol. 23: 55-69.

YONG, R.N. and WARKENTIN, B.P. (1966). Introduction to Soil Behaviour. The Macmillan Co.: New York, London.

YONGE, C.M. (1932). On the nature and permeability of chitin. I. The chitin lining the foregut of decapod Crustacea and the function of the integumental glands. Proc. R. Soc. Lond. 111(B): 298-329.

YONGE, D.K. and RHOADS, D.C. (1971). Animal-sediment relations in Cape Cod Bay, Massachusetts. I. A transient study. Mar. Biol. 11: 242-254.

ZOBELL, C.E. (1938). Studies on the bacterial flora of marine bottom sediments. J. sedim. Petrol. 8: 10-18.

ZOBELL, C.E. (1946a). Marine Microbiology. Chronica Botanica Company: Waltham, Mass.

ZOBELL, C.E. (1946b). Studies on redox potential of marine sediments. Bull. Am. Ass. Petrol. Geol. 30: 477-513.

ZOBELL, C.E. (1973). Microbial and environmental transition in estuaries. pp. 9-34. In: Estuarine Microbial Ecology. Eds. L.H. Stevenson and R.R. Colwell. University of South Carolina Press: Columbia, South Carolina.

ZOBELL, C.E. and FELTHAM, C.B. (1942). The bacterial flora of a marine mud flat as an ecological factor. Ecology 23: 69-78.

ZOLA, H. (1967). Sugar phosphate polymers in polychaete tube and in mineralized animal tissue. Comp. Biochem. Physiol. 21: 179-183.

FUTURE EXPERIMENTS

1. The effect of animal secretions and other organic matter on the distance that particles are transported laterally (this would probably best be done under laboratory conditions).

2. Seasonal effects of animal secretions on sedimentation.

3. Test whether animals produce more or less secretory material in preferred sediments, and then test the effect of this on sedimentation. This would involve prior experiments on the preferences of the different species, which is a major undertaking.

4. Test differences in the amount of secretions produced by animals over different times and the subsequent effect of this on sedimentation.

5. Test different times of disaggregation of sediment held together by secretions.

6. Identification of the chemical nature of the secretions produced by the species used in this study.